The U.S. Military's Toxic Legacy

America's Worst Environmental Enemy

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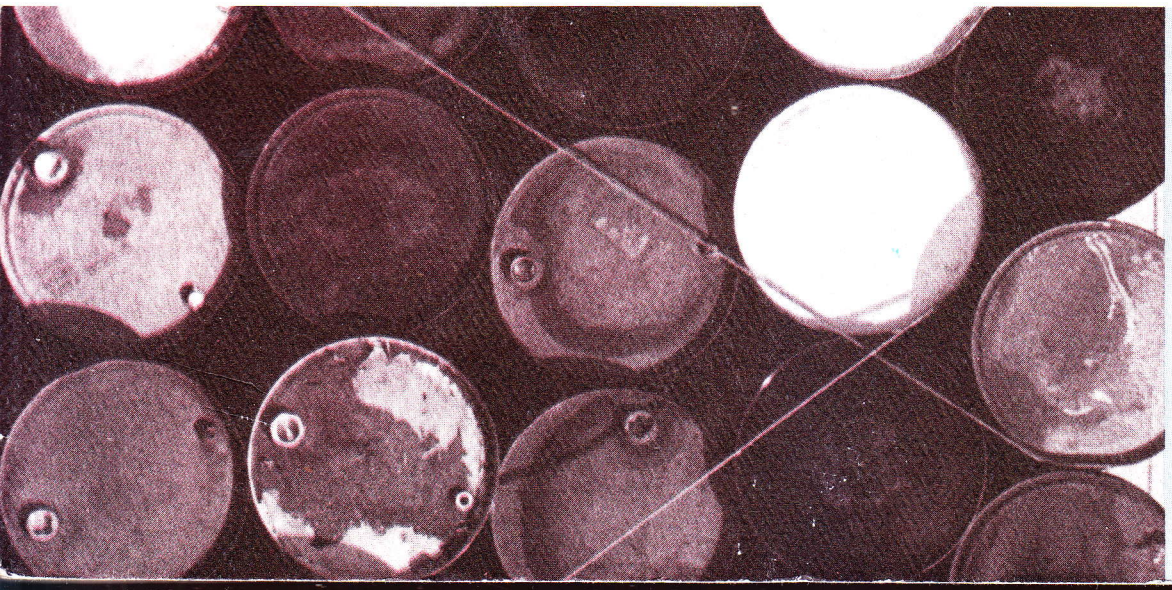

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America's Worst Environmental Enemy

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The U.S. Military's Toxic Legacy

A Special Report on

America's Worst Environmental Enemy

The National Toxic Campaign Fund

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January 1991

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Executive Summary

Background

Imagine, for a moment, that a foreign nation has dispatched a band of terrorists to the United States. The intruders silently move across the landscape depositing toxic chemicals at a thousand sites around the country. Some of the toxic compounds quickly enter the rivers and underground reservoirs that supply America with drinking water. Other chemicals contaminate our neighborhoods and backyards where our children play. Still others sit like time bombs, destined to contaminate our water supplies after months, years, or even decades. The toxic chemicals carried by these enemies are the products of the most sophisticated laboratories on Earth. They cause birth defects, liver disease, and cancer. Their effects may be felt for generations.

Unquestionably, if this imagined threat were real, we would turn to the Pentagon to combat this threat to our national security. After all, the Pentagon's job is to defend the nation against outside enemies.

But what do we do when the threat comes, not from abroad, but from the Department of Defense (DOD) itself? What if our own worst enemy is the same institution that is charged with defending us?

The frightening reality is that in the name of "national defense," the United States military has cast a chemical plague over our country and many of our allies through its misuse and disposal of dangerous chemicals. Toxic and radioactive pollution from U.S. military and weapons plants poses a direct and immediate threat to America's security and prosperity. The military has created *fifteen thousand points of blight,* on hundreds of bases and installations that are laced with toxic chemicals—threatening not only our own troops but innocent Americans living in adjoining neighborhoods. This is the military's toxic legacy, a product of forty years of the Cold War.

The military-industrial establishment—that is, the facilities of the DOD, military contractors, and the Energy Department's nuclear weapons production complex[1]—has accumulated a monstrous collection of toxic waste sites. What's worse, these same institutions continue to poison our air, land, and water at intolerable rates.

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[1]The massive environmental problems of the Department of Energy's nuclear weapons laboratories and factories are not featured in this report because they have been well documented elsewhere.

The Department of Defense and Toxic Waste

The U.S military is the nation's largest polluter. Virtually every major military installation in the U.S., as well as former bases and bases overseas, is responsible for extensive environmental contamination. The Pentagon's cleanup efforts, however, have barely begun.

The military has created far more toxic waste sites than any private corporation. Thus far, the Defense Environmental Restoration Program (DERP) has identified 14,401 likely hot spots at 1,579 military facilities, but it has reported completion of cleanup at only 287 sites. Nearly 100 DOD installations are on the Environmental Protection Agency's (EPA's) "Superfund" National Priorities List (NPL), which means they are among the most hazardous places in America.[2]

In addition to its own bases, the military is responsible for dangerous contamination elsewhere. The Pentagon is a Potentially Responsible Party (PRP)—that is, it may be held liable for cleanup—at 53 privately owned NPL sites, including dump sites, properties formerly owned by the military, and contractor-owned weapons plants. For example, at least 15 separate military installations sent hazardous waste to the Maxey Flats Nuclear Disposal Site in Morehead, Kentucky, a dump site closed in the late 1970's. Maxey Flats was a "kick and roll" facility: Its operators kicked drums off the backs of their trucks, rolled them into a pit, and covered them with dirt. DOD is currently investigating over 7,000 former properties for potential contamination.

The military's environmental problems do not end with past dumping. In producing, maintaining, testing, and even dismantling military vehicles, explosives, chemical weapons, and rocket fuel, the military generates enormous amounts of deadly, environmentally destructive waste products. In 1989, DOD estimated that it generated about 900 million pounds of hazardous wastes, as well as 17 billion pounds of wastewater, much of it contaminated with toxic chemicals. Furthermore, in 1989, DOD was also responsible for 658 oil and toxic waste spills that required cleanup.

Until recently federal facilities, often exempt from the enforcement powers of environmental regulators and hiding behind a veil of "national security," never developed—in fact, never even considered—sound pollution prevention and waste management practices. By the time neighboring communities discovered their homes were built on toxic trash or their water supplies contained cancer-causing poisons, irreversible damage had been done.

For example, over 1000 residents on the South Side of Tucson, Arizona are suing the U.S. Air Force and Hughes Aircraft because of a high concentration of brain

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[2]We count 97, including Air Force Plant 44 in Tucson, Arizona and the Twin Cities Army Ammunition Plant in Minnesota. Those two sites are often listed as part of larger, civilian NPL sites.

tumors, cancers, and newborn heart defects among residents. For many years, South Side residents drank well water contaminated with trichloroethylene (TCE), a major portion of which came from Hughes' industrial wastes. The citizens blame water contamination from Air Force Plant 44, where Hughes has produced tactical missiles for nearly 30 years, for their illnesses and deaths. Because TCE is recognized as a mutagen and a probable carcinogen, EPA has established a drinking water standard of five parts per billion. The concentrations of TCE found in South Side drinking water far exceeded the EPA standard.

Military bases across the country continue to threaten surrounding communities with similar toxic releases, ranging from plumes of TCE-contaminated groundwater to acidic emissions from the open burning of solid rocket fuel. In some places, contamination has not yet reached the public — or at least, no knows about it yet.

In 1990, the DOD's Defense Environmental Restoration Program published a glossy annual report, complete with photos and a comprehensive list of facilities requiring cleanup. As required by law, it presented a page of detailed information about contamination and cleanup efforts and plans for each military facility on the National Priorities List. In the report's introduction, President Bush and Defense Secretary Cheney promise that DOD will take a leadership role in environmental protection.

Unfortunately, the Pentagon's environmental record has been abysmal. At facility after facility, DOD has concealed or denied the impact, extent, and even the existence of toxic contamination. Moreover, DOD's growing military cleanup program is dwarfed by the enormity of its other missions. Although certain officials at DOD undoubtedly take the task of toxic cleanup seriously, they are a minority swimming upstream against an inglorious history of military negligence and irresponsibility, as well as a budget which has not been rising sufficiently to the occasion.

The military's foot-dragging, of course, does more than frustrate regulatory agencies. The longer a site remains polluted, the more likely poisons will enter the surrounding soil and groundwater and affect human health. Even in the absence of new leaks or dumping, underground contamination spreads—moving faster than the military bureaucracy responsible for cleaning it up.

Furthermore, the military is often unwilling to spend the money necessary to decontaminate sites. Often it lacks a reliable, appropriate cleanup technology. In many cases, the term "cleanup" is a misnomer. For example, in 1984 the Army drained, capped, and seeded with grass its former toxic effluent lagoons at the Milan Army Ammunition Plant in Milan, Tennessee. Capping reduced the water pressure that was spreading contamination of dinitrotoluene (DNT) and other poisons underground, but the Army decided to save money by letting the hazardous waste indefinitely sit underground.

At other sites, like Jefferson Proving Ground and the Rocky Mountain Arsenal, the military may have created "national sacrifice zones," where contamination is so severe and cleanup so expensive that they may be fenced off and left for future generations to address.

Finally, DOD "cleanup" can actually increase the immediate threat that sites pose to public health. The Pentagon points with pride to its incineration projects, but the release of deadly poisons into the atmosphere is an unavoidable by-product of incineration. In addition, incineration creates toxic ash, which finds its way into solid waste dumps. At the Rocky Mountain Arsenal, the Army "cleansed" soil poisoned with nerve gas agents and pesticides by aerating it and allowing toxic fumes to waft through a neighboring residential community.

Base Closures and Toxic Contamination

The cleanup task becomes even more urgent as the military decides to close bases and transfer them to private ownership or another public agency. In 1989, Congress approved the recommendations of the Commission on Base Realignment and Closure, agreeing to the closure or partial closure of 36 bases. Although Congress has torn up Defense Secretary Cheney's 1990 list of 29 proposed base closures, it has established a new commission that will recommend many more shutdowns beginning 1991.

The presence of multiple toxic pollution sites on many of these bases is a major obstacle to conversion to civilian use. If bases cannot be redeveloped, it is practically impossible to overcome the economic losses of closing. The prospect of otherwise valuable land sitting idle while former base workers seek jobs elsewhere is a political nightmare that could undermine the conversion process. Until cleanup is achieved, the military's toxic legacy may lock up a good portion of the nation's most desirable real estate.

In its fiscal 1991 appropriations, Congress for the first time allocated funds for cleanup at bases undergoing closure. It should continue to budget such funding. Furthermore, to permit the *safe* redevelopment of closed installations, the states and other bodies responsible for land use planning must quickly develop and implement environmental standards for base reuse.

DOD Environmental Programs Are Starved for Funds

The Environmental Protection Agency estimates that the cleanup of domestic DOD facilities will cost $20 billion to $40 billion, and will take decades to complete, but

those projections are likely to rise. The DOD Inspector General's office told the *Los Angeles Times* that the cost could reach *$100 to $200 billion.*[3] Affected citizens and government investigators continue to find new contamination, and the public is increasing its demands for decontamination, not just containment, of military toxic sites. These estimates do not include the costs of complying with environmental laws, the development and adoption of pollution prevention technologies, cleanup at foreign bases, or the monumental task of containing wastes at the Department of Energy's nuclear weapons plants.

The failure to provide adequate funds is by far the greatest obstacle to the timely, proper cleanup of military hazardous wastes. Funding by itself will not solve the myriad of Pentagon contamination problems, but without it the Defense Environmental Restoration Program cannot even approach its stated goals. In fiscal year 1990, DERP received about .2 percent of the annual military budget. In 1991, Congressional critics of DOD's slow cleanup effort managed to boost the annual appropriation to over $1 billion, (still less than .4 percent of the DOD budget), but more will be needed as additional toxic sites move from the investigation stage into the more costly remedial stages.

Now that the "Communist threat" is disintegrating, one might expect funds to flow quickly away from military weapons purchases and toward a comprehensive effort to clean up the mess the military made in this country during the Cold War. Unfortunately, that's not how things work in Washington. As the Pentagon trims its non-Persian Gulf budget, military officials at all levels, as well as their allies in Congress, are circling the wagons to protect their slices of the military-industrial pie. As a result, it will be difficult to secure a significantly larger share for environmental work.

Even if adequate funds were budgeted, the Pentagon still would have trouble getting its environmental work done. Increasingly dependent upon contractors and consultants for technical analysis, planning, and management, government agencies are less capable than ever of making sure that jobs are done right. Overdependence upon private contractors may undermine the quality, reliability, and public confidence in cleanup and oversight.

In response to lobbying by environmental activists, Congress recently ordered DOD to assess the anticipated shortage of environmental professionals and to initiate additional training programs. It is too soon to evaluate the adequacy of these initiatives.

Training military personnel for environmental cleanup and research into safer materials management would also address the problem of finding work for troops and DOD employees who are displaced by the downscaling, at home and abroad, of the U.S. military.

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[3]John Broder, "Report Faults Pentagon on Toxic Cleanup," *Los Angeles Times,* July 11, 1990, p. A14.

Are Toxics "Missing in Action"?

Just as staggering as the military's toxic wastes are the inconsistencies and gaps in government data pertaining to them. Reliable information systems are essential for tracking toxics from cradle to grave and implementing pollution prevention, but the Defense Department does not really know how much hazardous waste it generates, nor what happens to it.

In 1986, Congress passed the Community Right to Know Act, which requires companies to report their toxic chemical releases to the air, water, and land and to develop plans for chemical accident emergencies. Unfortunately, DOD has exempted itself from reporting its toxic chemical releases under the Act's Toxic Release Inventory (TRI). Consequently, there is no unified reporting of DOD toxic emissions. Indeed, different Defense agencies and commands—even different facilities within commands—use different measurement standards. Regulators and the public have been presented with overall Pentagon waste generation figures that are more like "guesstimates" than the hard numbers such a serious issue demands. At most individual bases, no data is available at all.

For instance, in its 1989 Defense Environmental Status Report (DESR), the DOD reported generating 876 million pounds of concentrated solid and liquid toxic wastes.[4] DESR contains no site-specific information, so the data cannot be cross-checked or applied to particular sites. Even worse, DOD's own environmental staff considers the DESR estimates insupportable, and they may stop collecting the numbers in the future. If this occurs, DOD will be even less accountable for its toxic waste generation.

The Defense Reutilization and Marketing Service (DRMS), the DOD agency responsible for the off-site transfer, storage, and disposal of hazardous wastes, received 178 million pounds in 1989. DRMS not only fails to publicly document its waste management activities, but its internal records do not accurately track the wastes. In fact, the DRMS disposal database couldn't account for 72 million pounds of hazardous waste, 40 percent of the total transferred to DRMS. In addition, DRMS could not supply the name of a contractor that it hired to dump 1.5 million pounds of toxic waste in South Carolina, Illinois, Ohio, and Puerto Rico.

Much of DRMS's failure stems from its original function, which has always been to transfer unnecessary military equipment to "Army-Navy surplus" wholesalers. In fact, dangerous surplus chemicals have turned up leaking, in storage areas owned or leased by private surplus wholesalers, because DRMS has sold them without proper

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[4]This includes PCB's (polychlorinated biphenyls) and used oil.

controls. But what may be an excusable inaccuracy for Army boots becomes ludicrous in the management of toxic waste.

The problems at DRMS are only the tip of the DOD hazardous waste data management iceberg. There is no central management system whatsoever for an estimated 700 million pounds out of 900 million generated in 1989.

Who Is Guarding the Fort?

Scores of military installations are violating federal environmental laws. Yet the number of violations detected only reveals a fraction of the DOD's environmental noncompliance, since the EPA lacks the both the staffing and the clear authority needed to oversee rigorously DOD environmental practices.

Congress' General Accounting Office (GAO) recently found that on average about 22 percent of DOD's major wastewater dischargers were violating the Clean Water Act in any given three-month period, compared with a 15 percent rate among other federal facilities and a 10 percent violation rate among major private industrial facilities. Many, but not all, violations involve toxic substances, including un-permitted releases of cyanides, acids, metals such as cadmium, chromium, zinc, and copper, and phenol. More specific information was not available because out of about 400 military installations with water discharge permits, fewer than 12 percent reported toxic releases to EPA.

The Navy has a particularly bad record. Since pollution from ships at sea is exempt from Clean Water Act coverage, the Navy is accustomed to dumping waste "overboard." During a two-year period, at least 65 percent of its major permitted installations were out of compliance with priority Clean Water Act program requirements for at least one quarter.

Federal facilities are supposed to comply both procedurally and substantively with the same hazardous waste management and cleanup legislation that applies to private industry. However, the ability of the EPA and the states to enforce those laws is a point of contention. While EPA officials seek authority to clamp down on Federal hazardous waste violators, the Justice Department invokes the theory of the "unitary executive," which argues that disputes must be resolved administratively. The Justice Department refuses to bring suits against the military on behalf of the EPA.

The states and many members of Congress assert that states can order the Pentagon, Energy Department, and other Federal agencies to comply with hazardous waste laws. But the Justice Department contends that Federal agencies are exempt

from state enforcement under the doctrine of "sovereign immunity." Several important cases on this issue are awaiting adjudication in Federal court.

Unwilling to wait for the courts to fully resolve the issue, the states and territories want Congress to clarify that sovereign immunity does not apply to hazardous waste law enforcement. Other environmental legislation, such as the Clean Air Act, explicitly waives sovereign immunity in its enforcement provisions.

In 1989, the House overwhelmingly passed HR 1056, which would have given EPA and the states clear authority to enforce hazardous waste laws, but the Senate version, the Federal Facilities Compliance Act (S. 1140), never came to a vote. DOD opposed this legislation because, its spokesmen argued, it would, in effect, give outsiders control of the limited DOD environmental budget.

Military Contractors Are Above the Law

Military contractors make up a large and influential segment of the U.S. industrial economy. The largest military contractors include well-known aerospace corporations, such as Lockheed, McDonnell Douglas, and General Dynamics, major manufacturers such as General Motors, General Electric, and IBM, and oil companies such as Chevron, Exxon and Shell Oil.

Many defense contractors are listed as Potentially Responsible Parties for NPL hazardous waste sites, which means, under the Superfund Law, that they will be billed for cleanup. Some of the nation's wealthiest defense companies pose the gravest threat to environmental security. For example, the top 10 military contractors are listed 133 times by the EPA as PRP's at the nation's 100 most serious Superfund sites. General Electric tops the list with 47 sites where it is a PRP.

Though governed by the same environmental laws that regulate other private industries, military contractors present unique problems by virtue of their cozy relationship with the federal government. Many military-oriented companies behave as environmental outlaws, and then they expect the Pentagon to bail them out once their reckless environmental practices come to light.

The Boeing Corporation's deal with the Air Force illustrates this point. Boeing dumped 24 million gallons of toxic waste into two Seattle-area landfills over the course of thirty years. Both sites are now on the Superfund NPL, and Boeing, as the largest dumper, has accepted liability for most of the cleanup costs at these sites. However, the company has also convinced the Air Force to reimburse cleanup costs of up to $27 million if the company's insurers don't cover this liability.

The Air Force, which has already paid nearly $13 million, says that cleanup is a normal cost of doing business. The Pentagon has reportedly agreed to reimburse

Boeing's cleanup teams at several other sites nationwide, including a plant in Wichita, Kansas with extensive TCE groundwater contamination.

Other firms, such as Aerojet-General and Lockheed, are also sending the bill to American taxpayers to clean up their toxic messes. Lockheed expects the Pentagon to reimburse it for cleanup at its company-owned plants at Harbor Island (Seattle, Washington), Burbank (California), and Sunnyvale (California), as well as the Operating Industries landfill in Monterey Park, California, where Lockheed is a PRP.

Government-Owned Contractor-Operated (GOCO) facilities are also among the Pentagon's biggest toxic headaches. Sixty of DOD's sixty-six GOCO's show up on the Defense Environmental Restoration Program list of cleanup installations. Because they work so closely with the DOD, the private GOCO contractors often escape accountability for their environmental mistakes.

William Parker, until recently the Pentagon's top administrator for environmental affairs, told Congress why DOD bails out its GOCO contractors:

> The Department funds most cleanup costs for sites created by past practices at GOCO's. In effect, the responsible contracting officers in the DOD components [the armed services and Defense Logistics Agency] have determined that the operating contractors were using facilities provided by the government in ways commonly accepted as reasonable business practices at the time the contamination occurred. If we subsequently determine, however, that the contamination was caused by illegal activities or grossly negligent contractor operations, we will seek reimbursement.[5]

Given the abysmal environmental records at numerous GOCO's, the Pentagon's standard for "gross negligence" must be remarkably high. In contrast, as Congressman Mike Synar (D-Oklahoma) pointed out to DOD officials, owners and operators of civilian Superfund sites are not excused from financial responsibility because they used methods that were "acceptable at the time of disposal."

In some cases, the Pentagon has actually rewarded contractors for their pollution. For example, the Air Force hired Hughes Aircraft to clean up the groundwater it poisoned in Tucson, so Hughes made a profit correcting its own mistakes. In fact, Hughes "gold-plated" its cleanup operation, building an expensive computerized control center.

The bottom line is that the American taxpayer has been stuck with a monumental bill for decades of environmental wreckage by both DOD and its military contractors.

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[5] *Overview of DoD Environmental Activities,* Hearings, Environmental Restoration Panel, House Armed Services Committee, May 2, 1989, pp. 265-266.

The Military's Chemical Connection

A part of the military's destruction of the American environment extends far beyond the 1500 installations where contamination is now known to exist. Military purchasing power is, in fact, driving much of the environmentally destructive behavior of our entire economy.

The military is a major consumer of hazardous materials. Military purchases directly account for 13 to 16 percent of the U.S. final-demand chemical market. In addition, military contractors, particularly weapons manufacturers, are major buyers of chemicals and other hazardous materials. For example, in 1986 the U.S. military and its contractors purchased half of the 150 million pounds of CFC-113 (chlorofluorocarbon-113, also known as Freon) used in the U.S. CFC-113 vapors break down the ozone layer, in the upper atmosphere, that protects the Earth from deadly ultra-violet solar radiation. In 1988, military contractors were responsible for 55 percent of the industrial CFC-113 releases in Florida. In 1986, the Navy and Air Force accounted for 16 percent of the combined U.S. emissions of two other ozone-depleting chemicals, Halon 1211 and Halon 1301. Thus, in the name of national defense, the military has been a major culprit in destroying the Earth's protective shield.

These purchases are guided by military specifications (mil-specs), which dictate exactly what types of materials and products military installations and contractors may purchase. Military procurement regulations have defined the market for a number of widely used, environmentally destructive materials, such as cadmium, TCE, and ozone-destroying CFC-113.

William Parker, while Deputy Assistant Defense Secretary, explained the far-reaching impact of the Pentagon's requirement for CFC-113 use:

> A shift away from CFC-113 is difficult, especially for the production of military equipment, because U.S. military specifications for soldering and cleaning as written discourage the use of alternative non-ozone depleting materials. These specifications have become the de facto world standard for electronic equipment manufacture...[6]

The military market comprises such a large portion of the US economy that major pro-environment shifts in purchasing could help to redirect industrial practices

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[6]William H. Parker, III [Deputy Assistant Secretary of Defense (Environment)], "CFC's and Halon Use Reduction within the Department of Defense," paper presented to the United Nations Environmental Programme seminar on "Substitutes and Alternatives to Chlorofluorocarbons (CFC's) and Halons," October 20, 1988.

throughout the US and even worldwide to promote safer materials use and pollution prevention.

Unfortunately, DOD's efforts to reduce CFC use, like most changes in Pentagon policy, is proceeding at a snail's pace. Commercial manufacturers of printed circuit boards have already implemented alternate, water-based cleaning methods, but the Pentagon has not yet given them the mil-spec stamp of approval.

Over There: Environmental Contamination at Bases Overseas

Published U.S. government reports on hazardous waste management and contamination routinely ignore the U.S. military's roughly 120 major foreign installations. However, the grim truth has begun to surface: U.S. overseas bases are leaving a trail of toxic contamination around the globe. With no effective mechanism for enforcing, let alone monitoring, environmental compliance, overseas bases have run up a cleanup and compliance bill which could add billions of dollars to the Pentagon's liabilities if the U.S. accepts responsibility, and which could estrange us from our closest allies if we do not.

The *Los Angeles Times* reports, "The Air Force has acknowledged that it has polluted the soil, streams, or ground water at every one of its airfields in Europe."[7] The Army has identified 358 contaminated sites in West Germany alone. Of the total, at least 30 are on bases slated for closure. The Army, which tends to underestimate cleanup costs during the initial assessment of contamination, figures that 26 hot spots will require more than a million dollars each to clean up.

Despite some progress in changing its domestic environmental practices, the Pentagon bureaucracy has stonewalled abroad. In 1986 the General Accounting Office studied the hazardous waste activities of foreign facilities, but the Pentagon has classified its report as "confidential." Another GAO study, now underway, is also secret.

In its internal documents, the Army estimates its long-term German cleanup bill to be $162 million. Yet in official military budget submissions known as A-106 reports, DOD projects spending only $1 million dollars on cleanup in Germany over the next five years, and a miserly $2 million worldwide. The Pentagon also plans to spend about $83 million on sewage treatment facilities at 83 projects in Germany in the same time frame. Ironically, the government is spending more on sewage treatment in Germany over the next five years than it is to clean up Boston Harbor.

Germany, with the greatest concentration of U.S. troops abroad over the last two decades, may have the most widespread toxic contamination of American foreign bases, but problems are found almost everywhere U.S. forces have made camp.

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[7]John Broder, "U.S. Military Leaves Toxic Trail Overseas," *Los Angeles Times,* June 18, 1990, p. A15.

Landowners in Iceland, for example, are seeking restitution for damage caused by toxic waste dumping more than twenty years ago at a mountaintop U.S. radar site. The Philippines, with the largest U.S. bases abroad, may have the worst problems. David Berteau, a top Pentagon official, has said: "If there's a horror story out there...Subic [Bay Naval Station] may be it."[8] Subic's ship repair facility, a major industrial complex, has reportedly released tons of chemical wastes into the bay. However, it doesn't have to worry about meeting environmental standards because the Philippine Republic has none.

Most hazardous waste is disposed of or sold in the country in which it's generated, but certain particularly hazardous materials, such as PCB's and ammunition boxes treated with pentachlorophenol (PCP) are often "retrograded" to the U.S. or sent to other countries. Furthermore, the U.S. currently ships military toxic wastes from Turkey, Greece, the Azores, and Iceland to England for disposal. Though the British people are unaware of their country's lethal imports, the Pentagon says this practice meets British requirements.

In theory, U.S. bases abroad are required to meet the environmental standards of stateside installations. In reality, no U.S. or foreign agency has the authority to enforce, or even monitor, environmental compliance at foreign U.S. installations. In late 1990, Congress ordered the Pentagon to devise a policy for determining applicable foreign environmental compliance requirements, and it called for a report describing the financial and personnel costs of such compliance.

Despite its growing awareness of military environmental problems abroad, Congress decided that "the environmental restoration of bases used by the United States in foreign countries is a host nation responsibility." While such liability may eventually be negotiated with many host country governments, telling foreign governments that they must pay to clean up pollution caused by U.S. forces may drive a wedge between the U.S. and many of its allies.

Our Best Defense

In the brief history of environmental politics, one principle stands clear: The best defense against the environmental offenses of the military establishment is public awareness and action. Environmental conditions improve when the people affected or threatened by environmental degradation insist upon democratic participation in "environmental security" decisions that threaten their lives.

In many parts of the country, environmental groups have organized effectively to clean up military sites—publishing reports, mounting demonstrations, filing lawsuits, and pressuring legislators. But many of the military's worst polluting installations have

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[8] *Ibid.*, p. A16.

escaped attention, and critics have focused on only one of many environmental problems at numerous facilities. Even if citizens succeed in enacting ideal pollution prevention legislation and win adequate funding for restoration programs, the DOD will need watchdogs on the ground to ensure that all the branches of the military industrial complex act responsibly.

People threatened by toxic contamination should have a right to know exactly what poisons were released into their neighborhoods, how much, and when the release occurred. Moreover, they should have the right to inspect and monitor military bases with their own experts. Finally, they should have the right to negotiate with base officials and contractors about environmental protection.

To allow citizens to fully participate in environmental protection around federal facilities, the Defense Department should offer up to $100,000 in Technical Assistance Grants to community groups at all military toxics sites, whether or not they are listed by Superfund, to allow them to monitor cleanup, compliance, and pollution prevention, and to cover the costs of community health and safety training by experts designated by those groups.

Despite its historical disregard for the environment, the Pentagon may, in the long run, be more responsive to public pressure than most other major polluters. After all, the American people are its sole "stockholders."

Today, the Pentagon has begun to acknowledge its environmental misdeeds of the past, and it has, at least on paper, committed itself to cleaning up its mess. In addition, DOD is working to reduce the amount of hazardous waste it actually generates. Moreover, Congress has decided to enlist the military's surveillance capability and research labs in the war on environmental degradation. At the urging of Senate Armed Services Committee chairman Sam Nunn (D-Georgia), it established the $150 million Strategic Environmental Research and Development Program.

In September, 1990, the Pentagon staged the Defense and the Environment Initiative (D&EI) conference in Bethesda, Maryland, bringing together several hundred people from government, industry, and environmental groups to highlight DOD's new environmental consciousness. Though the Pentagon locked grass roots activists out of the official plenary agenda, it displayed its new sensitivity by giving environmentalists unprecedented access to high-level military brass and DOD administrators in small group discussions.

Notwithstanding these efforts to reorient the military, however, the DOD's programs to reduce, control and clean up its hazardous wastes remain mired in bureaucracy and incompetence. The President and Congress have simply not provided sufficient funds to meet DOD's environmental goals. The once-promising Defense and the Environment Initiative, without a staff, has not yet even sent reports to its conference participants.

Before public policy-makers can seriously consider proposals to use the military's technical expertise to fight a "war on pollution," the DOD must prove itself capable of cleaning up its own backyard and using its tremendous influence in procurement policies to redirect the U.S. economy toward sustainable production.

If America is ever to set high standards for environmental protection and restoration, government agencies must serve as a model, by taking strong, visible steps to involve the public in environmental decisions to prevent pollution and to restore polluted air, land, and water. Pentagon leaders now say they want DOD to play such a role, but its record of environmental carnage and institutional arrogance doesn't inspire much confidence.

Now that the Berlin Wall has fallen and the threat from the Communist nations has all but disappeared, it is time for America to re-examine its continued reliance on a massive military-industrial complex, especially one that is itself a grave threat to our environmental security.

This report documents the last battle of the Cold War—the military's battle against the environment and the American public. We hope it serves to sound the alarm for a redefinition of national security to include environmental security, since without a safe environment and healthy communities we can never truly be free and secure.

Key Recommendations

There are seven basic principles that summarize most of the report's recommendations:

❶ The Pentagon, the Nation's Largest Polluter, Should Clean Up Its Own Mess First.

The Department of Defense is responsible for 14,401 toxic waste sites at 1,579 domestic facilities, nearly 100 of which have already been placed on the Superfund National Priorities List. Even after its critics forced a doubling of cleanup funding, DOD is still spending less than .4 percent of its annual budget on environmental restoration. Before the Pentagon unleashes its exotic technical capabilities to fight the war on pollution, as Senator Nunn has suggested, it should clean up its own backyard first, without endangering surrounding communities.

❷ End the Double Standard: Stop the Military's Exemption from State and EPA Oversight.

Due to gray areas in Federal law, the DOD has been exempt from hazardous waste law enforcement by the Environmental Protection Agency and state regulatory authorities. We expect private companies to be accountable to environmental regulation while the government remains above the law. This double standard must end. The military must accept the authority of states and the EPA to enforce environmental compliance. Congress should speedily enact the Federal Facilities Compliance Act.

❹ Stop Promoting the Toxic Economy: Change Military Specifications and Procurement Policies.

Through its procurement specifications, the DOD requires the use of ozone-destroying chemicals and other dangerous materials. By the end of 1991, DOD should review all military specifications requiring the use of toxic or dangerous substances and plan to eliminate, on a set timetable, requirements for substances that cause or probably cause cancer, birth defects, genetic mutations, neurological problems, and other serious health problems. In addition, to build the market for environmentally sound products, DOD should require its components to purchase large quantities of non-polluting vehicles, photovoltaic cells, recycled paper and other goods, and even fruits and vegetables grown without any cancer-causing pesticides and herbicides.

❺ Stop the Cover-up of Foreign Base Contamination.

DOD has kept secret the full story of its tremendous overseas toxic waste problems, even blocking the public release of completed government reports. DOD should come clean with this information and make all reports and records available for public review. DOD should include foreign bases in its Defense Environmental Restoration Program.

❻ Recognize Citizens' Right to Know and Right to Participate in Environmental Protection.

Every military installation should immediately begin reporting its toxic chemical releases into the air, water and land under the Toxics Release Inventory (TRI) of the Community Right to Know law. Without this information, neither the public nor the military itself will ever know the full extent of the DOD's environmental problems or its progress toward reducing chemical wastes. In addition, DOD should recognize the rights of citizens to inspect military bases, take samples, and negotiate with base officials about environmental cleanup and pollution prevention.

❼ Provide Sufficient Funds to Support "Environmental Security."

A. America needs a fully funded **Defense Environmental Security Budget** that clearly describes all Pentagon programs for environmental restoration, environmental protection, pollution prevention, and environmental research and development.

B. A Defense Environmental Compensation Fund, with its own, one-stop administrative system, should be established to meet the urgent needs of people whose health and property have been harmed by military contamination. These monies should be made available without forcing victims to sue to obtain them, and they should cover such needs as medical care and screening, replacement water supplies, and relocation. Victims' recourse through this fund should not preclude later recourse through the courts.

C. A Defense Environmental Retraining Program—a new version of the "GI Bill"—is needed to ease the conversion of the nation's labor force to a peacetime, environmentally sound economy. Funding should be provided for retraining and transitional support for both military and contractor employees. The program should retrain these employees for cleanup, research and development, or other "environmental security" work.

❼ Establish a High-Level Environmental Program at the DOD

DOD should consolidate supervision of its environmental programs, including pollution prevention and hazardous waste data management, in an office headed by an Assistant Secretary of Defense. DOD should remove the Defense Reutilization and Marketing Service from any responsibility for managing hazardous waste for DOD. Despite its efforts to overcome a history of incompetence, DRMS is not an appropriate agency for hazardous waste management. Finally, the consolidated environmental program should set standards for working with the neighbors of military bases, requiring each base to negotiate "Good Neighbor Agreements" to protect surrounding communities and reduce its use and disposal of hazardous materials.

Chapter 1

Mopping Up after the Cold War

As the Cold War comes to a close, the American military is entering a new era. The Soviet Union is no longer our chief national security threat. Increasingly, threats to our national security derive from problems of economic and environmental imbalances. Some of our gravest enemies are those that are destroying the life support systems of the planet. From this perspective, the U.S. military is our own worst environmental enemy.

The frightening reality is that in the name of "national defense," the United States military has cast a chemical plague over the land through its misuse and disposal of dangerous chemicals. Toxic and radioactive pollution from our own military and weapons plants arguably pose a more direct and immediate threat to America's security and prosperity than any foreign government or organization. The military has created a thousand points of blight, a thousand bases and installations that are laced with toxic chemicals—threatening not only our own soldiers but innocent Americans living in adjoining neighborhoods. This is the military's toxic legacy, a product of forty years of the Cold War.

The Cold War's chemicals which permeate our environment include industrial solvents, paints and dyes, fuels and propellants, acids, pesticides, herbicides (containing dioxins), heavy metals, PCB's (polychlorinated biphenyls formerly used in transformers), photographic chemicals, refrigerants, asbestos, cyanide, and medical wastes. The chemicals found in the soil and water around Department of Defense (DOD) facilities read like a "Who's Who" of toxic waste. Some installations also contain wastes peculiar to military arsenals and ranges, such as nerve gas and unexploded artillery shells. Other sites, particularly at Department of Energy (DOE) weapons plants, are loaded with massive collections of combined radioactive and toxic wastes.[1] The eventual cost of cleaning up domestic military sites—that is, excluding the costs of cleaning up DOE facilities and foreign bases—may cost the nation as much as $200 billion.

Virtually every major military installation in the U.S., as well as numerous minor facilities and former bases, is has caused extensive environmental contamination. The known extent of DOD's toxic legacy continues to grow. DOD owns 3,874 properties in the U.S. and its territories, including 871 major military installations. As of September

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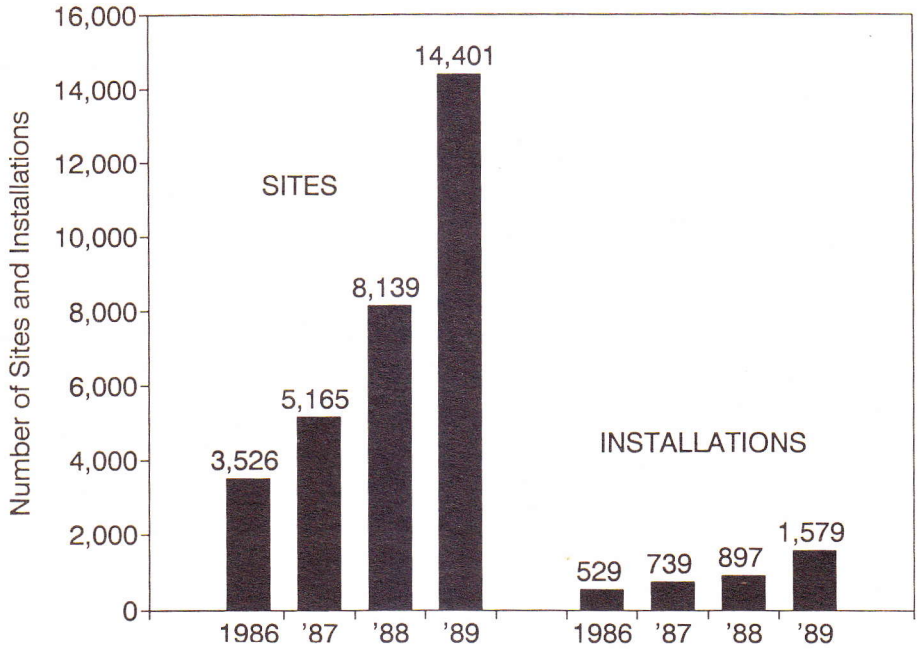
[1]The massive environmental problems of the Department of Energy's nuclear weapons laboratoriies and factories are not featured in this report because they have been well documented elsewhere. See, for example, *Deadly Defense Military Radioactive Landfills* (New York: Radioactive Waste Campaign, 1989).

30, 1986, DOD had identified 3,526 "potentially contaminated" sites at 529 locations. Three years later, the total stood at 14,401 sites at 1,579 locations.

FIGURE 1

MILITARY TOXIC WASTE SITES
REQUIRING CLEAN-UP



Source: Defense Environmental Restoration Program Annual Reports to Congress

At facility after facility, DOD has concealed or denied the impact, extent, and even the existence of toxic contamination. Minnesota Attorney General Hubert Humphrey III told Congress in 1987 how his state Pollution Control Agency (PCA) became aware of groundwater contamination from the Twin Cities Army Ammunition Plant (TCAAP):

> The Army was aware of pollution problems at TCAAP in the 1970's and compiled an internal report in 1978 on past disposal practices. Unfortunately, the Army did not alert State or Federal environmental officials to the report's findings. Minnesota did not find out about the problem until 1981 after a citizen provided the PCA a copy of the 1978 Army report obtained through the Freedom of Information Act.... Until last winter [1986] the Army refused to track contamination off post.... The TCAAP problem has dragged on for six years since the PCA was

first informed of the problem without a consent agreement or a coordinated, comprehensive program to address both on-post and off-post contamination.[2]

Even where early signs of toxic contamination at a given military site have been slight, the true extent of damage often proves vast. The recent history of the Tinker Air Force Base, near Oklahoma City, is typical. In 1982, the State of Oklahoma asked the Environmental Protection Agency (EPA) to include a Tinker drinking water well in a national groundwater survey. The EPA found industrial solvents in the well water, and closed a single well. A year later, a local resident brought state officials a foul-smelling sample of their household water; studies showed that it, too, was contaminated. By 1984 the Air Force reported to the EPA a 220-acre toxic plume containing trichloroethylene (TCE) and heavy metals such as chromium. The plume had reached the aquifer that provided drinking water to the entire base and 75,000 customers in nearby Midwest City.[3] Like so many DOD facilities, Tinker had routinely utilized and disposed of extremely hazardous materials in the easiest, quickest ways possible. Eventually the environment and the local community would pay the price.

The number of facilities identified as having contamination problems is expected to level off soon, since the armed services have surveyed most of their facilities. However, new problems will continue to surface at facilities already on the Defense Environmental Restoration Program (DERP) list. For example, in 1988 Fort Ord, California, was identified as having 20 potential toxic sites. By 1989 the base was shown to contain 166 possible hot spots.[4]

The Environmental Protection Agency (EPA) "Superfund" National Priorities List (NPL) contains sites for which the EPA has assumed jurisdiction to force a cleanup.[5] To list a property, whether it be public or private, the EPA must determine that a high relative "probability and magnitude of harm to the human population or sensitive environment from exposure to hazardous substances as a result of the contamination of ground water, surface water, or air" exists.[6] More than 1,200 public and private

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[2]*Environmental Compliance by Federal Agencies,* Hearing, Oversight and Investigation Subcommittee, Committee on Energy and Commerce, House of Representatives, April 28, 1987, pp. 116-117. Humphrey aggressively pursued the Army, and later that year, the Army, EPA, and Minnesota signed the first interagency agreement governing the cleanup of a federal facility: the Twin Cities plant. This illustrates a fundamental principle of the military's environmental programs: Political and legal pressure from state agencies and local activists can dramatically heighten the Pentagon's response to festering environmental problems.

[3]*Review of Hazardous Waste Cleanup and Disposal Efforts at Tinker Air Force Base,* Hearing, Environment, Energy, and Natural Resources Subcommittee, Committee on Government Operations, House of Representatives, December 13, 1984 (see especially pp. 64-65, 74-75); *Defense Environmental Restoration Program,* Annual Report to Congress for Fiscal Year 1989, February, 1990, p. B-83.

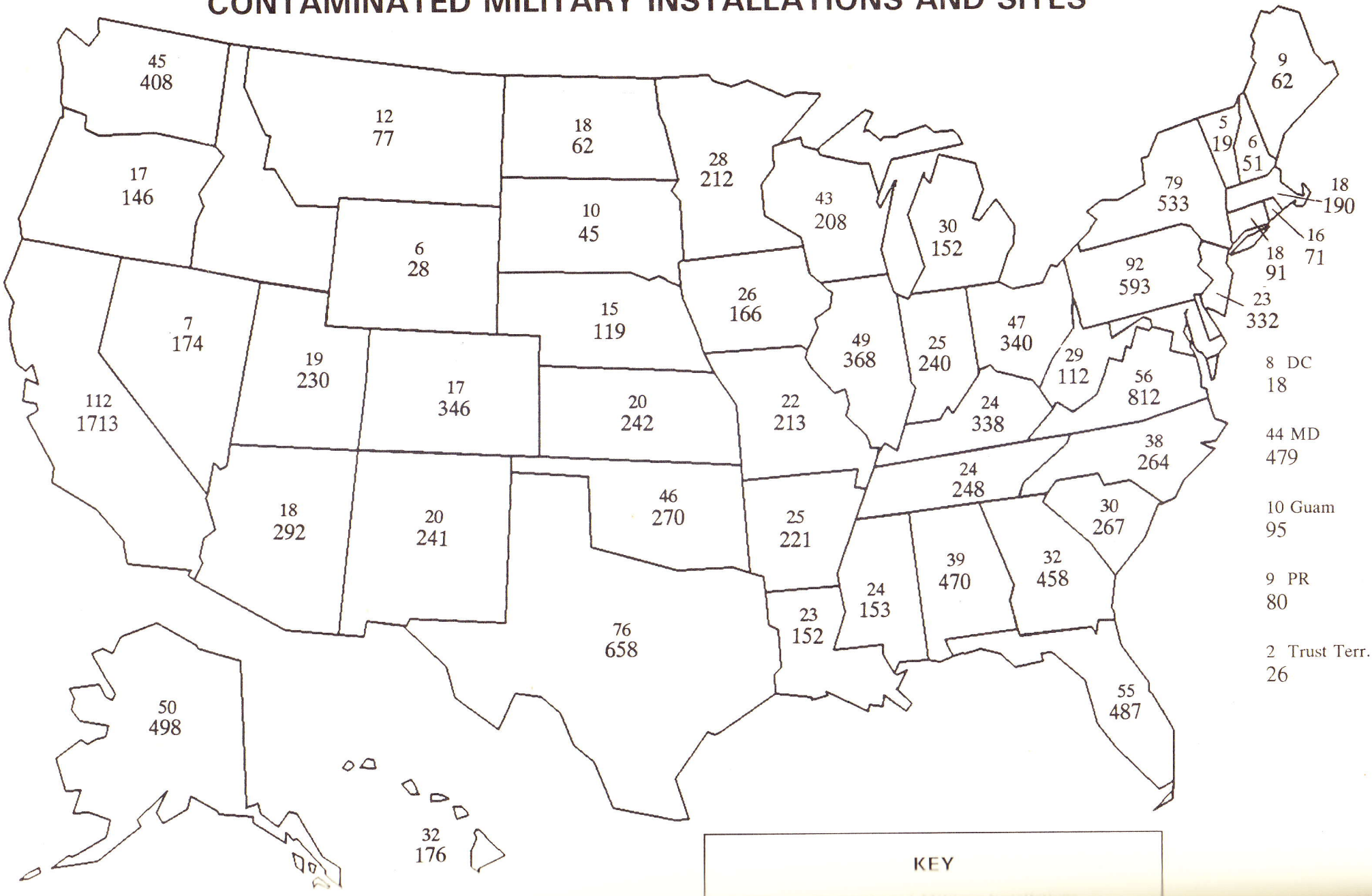
[4]*DERP* Annual Report for FY 1989, pp. 6, C-8.

[5]However, Federal Facilities on the NPL do not qualify for Superfund monies to aid in investigatin, cleanup, or the relocation of victimes. Funds are available only for alternative water supplies. CERCLA sec. 111(e)(3). In EPA parlance, a "site" corresponds to a DERP "installation."

[6]Original definition is from *Federal Register,* Volume 47, July 16, 1982, p. 31180.

FIGURE 2

CONTAMINATED MILITARY INSTALLATIONS AND SITES



stage into remedial action, the funding needs of the DERA account are expected to rapidly climb.

However, the funds being made available for cleanup are minuscule compared with the scope of the problems. The failure of the military to make cleanup funds available is by far the greatest obstacle to the timely, proper cleanup of military hazardous wastes. Funding by itself will not solve the myriad of Pentagon contamination problems, but without it DERP can not even approximate its stated goals. In fiscal year 1990, DERP received about .2 percent of the annual military budget. In 1991, Congressional critics of DOD's slow cleanup effort managed to boost the annual appropriation to over $1 billion, (still less than .4 percent of the DOD budget), but more will be needed as additional toxic sites move from the investigative stage into the more costly remedial stages.

In 1987 the Pentagon estimated that the cumulative cost of restoration at currently and formerly owned properties would reach from $9 billion to $14 billion (in 1987 dollars) over twenty-five years.[11] The number of DERP sites has tripled since 1987, but DERP has not updated its estimate. In 1989, EPA said the total could reach $20 to $40 billion. Most recently, *officials of the Defense Department Inspector General's office have estimated the cost of cleaning up military sites at $100 billion to $200 billion,* without even including the cost of cleaning up the Energy Department's nuclear weapons plants and U.S. military bases overseas.[12]

Clearly, the military is not yet ready to spend tens of billions of dollars on cleanups in the current fiscal year, since feasibility studies are still underway—or even pending—at so many sites. However, low-level DOD environmental officials say that much more money and personnel are needed now .Even work in the earlier stages of inspection and investigation has been slowed by the tightly limited funds. For example, the Army Corps of Engineers says it will take a three-member investigative team five years to check out a list of 270 formerly used military sites in Florida.[13]

In upcoming years the demand for funds will continue to rise as additional sites move from investigation into the more costly remedial stages. Environmental officials and base commanders need an assurance the money will be available. Indeed, DOD officials may be reluctant even to investigate potential toxic sites for contamination if there only are limited cleanup funds.

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[11] *Status of EPA Negotiations on Interagency Agreements Involving Toxic Waste Cleanups on Military Installations,* hearings, Environmental Restoration Panel of the Readiness Subcommittee, House Armed Services Committee, November, 1987, pp. 65-69.

[12] John Broder, "Report Faults Pentagon on Toxic Cleanup," *Los Angeles Times,* July 11, 1990, p. A14.

[13] Michael Koretzky, "WWII Sites in Clay among 6 Most Toxic," *Florida Times-Union,* November 15, 1990, p. B-6.

TABLE 1

Installation Restoration Funding

Fiscal Year	$ Millions	Growth Over Previous Year
1984	85.9	
1985	180.8	110%
1986	247.7	37%
1987	336.2	36%
1988	377.9	12%
1989	468.8	28%
1990	601.0	22%
1991 (approved)	1,062.0	77%

In 1990, Congress allocated an additional $25 million for cleanup and investigation at bases undergoing closure. In 1991, it voted $100 million.

Source: Congressional documents

DOD's Cleanup Rhetoric Doesn't Match Reality

In 1990, the Defense Environmental Restoration Program published a glossy annual report, complete with photos and a comprehensive list of facilities requiring cleanup. As required by law, it presented a page of details about contamination and cleanup efforts and plans for each military facility on the National Priorities List. It began with quotes from President Bush and Defense Secretary Cheney promising that DOD will take a leadership role in environmental protection.

Unfortunately, the reality is bleaker. The growing military cleanup program is dwarfed by the enormity of the Pentagon's other missions. Although certain officials at DOD undoubtedly take the task of toxic cleanup seriously, they are a minority swimming upstream against an inglorious history of military negligence and irresponsibility, as well as a budget which is not rising to the occasion.

Even where the military agrees to take cleanup action, such as through an agreement with state and Federal environmental agencies, quick and effective action is by no means the assured outcome. In 1989, several years after the discovery of groundwater contamination, the Navy signed its first interagency agreement.

governing the cleanup of the Moffett Field Naval Air Station in Mountain View, California. Though interim action, such as the removal of leaky fuel tanks, began soon after, the agreement's timetable does not require Remedial Construction until six years later, in 1995.

The military's foot-dragging does more than frustrate regulatory agencies. The longer a site remains polluted, the more likely poisons will enter the surrounding soil and groundwater and affect human health. Even in the absence of new leaks or dumping, underground contamination spreads—moving faster than the military bureaucracy responsible for cleaning it up.

In addition, when government acts slowly to clean up its own mess, it sends a strong signal to private firms that they needn't worry about their own toxic contribution. Indeed, Minnesota Attorney General Humphrey has stated that private Superfund cleanups in his state have generally slowed as a result of Federal inaction at the Twin Cities Army Ammunition Plant.

The term "cleanup" is often a misnomer, since the military is often unwilling to spend the money necessary to truly decontaminate sites. For example:

- In 1984 the Army simply drained, capped, and seeded with grass its former toxic effluent lagoons at the Milan Army Ammunition Plant in Milan, Tennessee. While the capping reduced the water pressure that was spreading the underground contamination of dinitrotoluene (DNT) and other poisons, the Army saved money by declining to remove the existing wastes at the site. As the hazardous waste will sit forever under the ground, its eventual spread into the wider environment is inevitable.[14]

- The Pentagon points with pride to incineration at places such as Fort. A.P. Hill, Virginia. Yet the release of contaminants such as dioxin into the atmosphere is an unavoidable byproduct of incineration. In addition, incineration creates toxic ash, which finds its way into solid waste dumps, thus transferring toxic problems to yet another site.

- At the Rocky Mountain Arsenal, the Army "cleansed" soil poisoned with deadly chemicals by aerating it and allowing toxic fumes to waft through a neighboring residential community.

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[14]"Poisons and the Pentagon," *Frontline,* Public Broadcasting Service, originally broadcast April 5, 1988, *DERP* Annual Report for FY 1989, p. B-62.

TABLE 2

DOD Cleanup Progress By State as of Sept. 30, 1989

Source: U.S. Department of Defense

State	potentially contaminated sites	clean sites
Alabama	470	17
Alaska	498	41
Arizona	292	4
Arkansas	221	28
California	1,713	21
Colorado	346	1
Connecticut	91	0
Delaware	87	0
District of Columbia	18	1
Florida	487	4
Georgia	458	0
Guam	95	1
Hawaii	176	1
Idaho	68	0
Illinois	368	6
Indiana	240	0
Iowa	166	0
Kansas	242	0
Kentucky	338	0
Louisiana	152	0
Maine	62	1
Maryland	479	2
Massachusetts	190	0
Michigan	152	3
Minnesota	212	4
Mississippi	153	8
Missouri	213	6
Montana	77	0
Nebraska	119	58
Nevada	174	0
New Hampshire	51	0
New Jersey	332	0
New Mexico	241	2
New York	533	6
North Carolina	264	1
North Dakota	62	0
Ohio	340	1
Oklahoma	270	8
Oregon	146	0
Pennsylvania	593	1
Puerto Rico	80	2
Rhode Island	71	2
South Carolina	267	4
South Dakota	45	0
Tennessee	248	3
Texas	658	26
Trust Territories	26	0
Utah	230	1
Vermont	19	0
Virginia	812	8
Washington	408	3
West Virginia	112	4
Wisconsin	208	0
Wyoming	28	0
Total	**14,401**	**287**

Military Poisons Dumped At Private Sites

In addition to government-owned NPL sites, the military is responsible for dangerous contamination far from the bases where the wastes were created. For example, in 1981 the military awarded a contract to American Electric Corp. to dispose of hundreds of transformers containing polychlorinated biphenyls (PCB's). But American Electric was not equipped to incinerate the extremely toxic chemicals, even though this was the only officially approved method of decontamination.[15] Instead, it moved PCB-laden oil to its Jacksonville, Florida facility. It sold hundreds of thousands of gallons of contaminated waste oil to local customers, including a local asphalt company. But most of the oil remained on the firm's property, which is now bankrupt, at what is known as the Yellow Water Road Superfund site.

The Pentagon is a Potentially Responsible Party (PRP)—which officially means that it may be held liable for cleanup—at 53 privately owned NPL sites, including dump sites, properties formerly owned by the military, and contractor-owned weapons plants.[16] For example, Norton Air Force Base and the Long Beach Naval Shipyard, along with a long list of private companies, are being held liable for cleanup at California's top-priority cleanup site, the Stringfellow acid pits in Riverside County. At least 15 separate installations sent hazardous waste to the Maxey Flats Nuclear Disposal Site in Morehead, Kentucky, a dumpsite closed in the late 1970's. Maxey Flats was a "kick and roll" facility, meaning its operators kicked drums off the backs of their trucks, rolled them into pits, and covered them with dirt.[17]

The Pentagon does not have a clear idea how much it will have to pay for cleanup at the privately owned sites. It has reportedly spent $50 million already, and a private consultant put the Air Force's liability at $507 million. By itself, the cost of restoring Maxey Flats, which also received wastes from other Federal agencies, is likely to exceed $200 million.[18]

At this time, it is impossible to determine just how high Pentagon off-base cleanup costs will go. At most sites, lengthy litigation and negotiation are required to divide up the liabilities. In many cases the military will ultimately pay the the lion's share because other culpable parties are bankrupt or defunct.

Still, if the Pentagon were to establish a consistent mechanism for keeping track of liabilities, it would be easier to generate and revise estimates. The bottom line is that the American taxpayer has been stuck with a monumental bill for decades of environmental wreckage by both DOD and its military contractors.

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[15]This doesn't mean that incineration is safe. Alternative methods of PCB detoxification must be developed.

[16]Appendix 3 lists those sites *Federal Liablities Under Hazardous Waste Laws,* Congressional Budget Office, May, 1990, p. 19, gives a total of 61 sites.

[17]Marie Cocco, "U.S. Also Expects Bills from Private Dumps," *Newsday,* February 6, 1990, p. 31.

[18]*ibid.*

Case Study: Jacksonville Naval Air Station, Florida

In 1984, a reporter and a local fisherman in Jacksonville, Florida brought 200 dead fish, covered with ulcerative lesions, to Dr. David Neal Boehnke, a professor of chemistry at Jacksonville University. Boehnke analyzed the fish, finding high levels of metals, chlorinated hydrocarbons, petroleum, and phosphate. The likely cause of the contamination was the Jacksonville Naval Air Station.[1]

The 3,820-acre Naval Air Station (NAS), one of three major naval facilities in the Jacksonville, Florida area, does not manufacture nerve gas. It does not test-fire uranium projectiles. Yet it has managed to leave a broad and hazardous trail of toxic contaminants. The NAS is on the Superfund National Priorities List, and it is largely responsible for the destruction of an off-base neighborhood five miles to the West, now known as the Hipps Road Superfund site.

Thus far, the Navy has identified at least 43 potential toxic waste sites at the Jacksonville NAS, including low-level radioactive materials as well as toxic chemicals and metals.

In the 1950's and 1960's, base workers openly burned hazardous waste. They shoveled the unburned portions of the waste, along with oil and solvents, into holes in the ground. The Navy recognized the contamination there in the late 1970's, when oil from these pits began leaching into a tributary of the St. Johns River. The Navy installed a system to trap floating oil while non-polluted water flowed underneath. At another spot, industrial wastewater was dried in unlined sludge beds. Contaminants seeped into the groundwater.[2] Other pollutants were dumped directly into storm drains leading to the St. Johns River.

In 1966, the Navy hired Wastecontrol of Florida to haul its dumpster garbage. Though the Navy promised, in the contract, not to place hazardous wastes in the dumpsters, the practice continued nonetheless. Wastecontrol employees never checked the contents and trucked the garbage to a small private landfill at Hipps Road. Eventually, the site was covered with soil and sold for housing.

After 14 years, residents of the homes constructed at Hipps Road started to taste and smell something foul in their well water. Tests showed twenty hazardous chemicals, including seven carcinogens. The residents started drinking bottled water, and Hipps Road was added to the Superfund list.

The Navy denied any responsibility, but as the topsoil washed away, chemical containers with Navy markings began surfacing in Hipps Road backyards. In 1985, EPA found that both the Navy and Wastecontrol were responsible. Soon after, several families were evacuated. With health complaints ranging from headaches to cancer, 150 Hipps Road families have taken the Navy to court.[3]

Meanwhile, the old landfill is now capped with clay. EPA, over the objection of many area residents, now proposes to extract contaminated water at off-site wells, use air stripping—that is, to release contaminants into the air—to decontaminate the water on-site, and then "dispose" of the treated water at an on-site pond.[4]

In 1983, a retired base worker suggested to a local TV crew that it investigate on-base pollution. It found 5,000 drums of hazardous waste, including many leaking their contents directly into the ground. Other wastes reportedly flowed directly to the St. Johns River. Moreover, a TV station reported that the children living in base housing were using a PCB-contaminated field as a playground.

The Navy improved its storage and disposal practices somewhat; but in 1989, state and local agencies found numerous violations of hazardous waste laws, including open containers, storage of unpermitted wastes, and a lack of monitoring wells at the old sludge-drying ponds. The Navy has taken steps to correct most of the violations, and it has hired additional environmental personnel. However, it is not possible to "undo" the health damage already inflicted on the community.

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[1] "JU Prof Links Fish Problems to Pollutants," *Compass,* 1989, and David Neal Boehnke, "The Jacksonville Naval Air Station as a Potential Large Polluter of the St. Johns River," Jacksonville University Department of Chemistry, February 20, 1989.

[2] "Response to Questions from Representative Wise to the Navy," Naval Air Station Jacksonville, November 20, 1989, p. 5.

[3] "Poison and the Pentagon," *Frontline,* Public Broadcasting Service, originally broadcast April 5, 1988.

[4] "Hipps Road Landfill Superfund Site," EPA Region IV, June, 1990; Michael Koretzky, "EPA Clean-Up Plans Leave Residents Cold," *Jacksonville Times-Union, Westside Community News,* November 7, 1990, p. 1.

The Cold War on Public Health

Over 1000 residents of the South Side section of Tucson, Arizona are suing the U.S. Air Force and Hughes Aircraft because residents have experienced a high concentration of heart defects among newborn infants, as well as brain tumors and other cancers. The citizens blame water contaminated with trichloroethylene from Air Force Plant 44, where Hughes has produced missiles for nearly 30 years, for their illnesses and deaths.[19]

Residents of Cape Cod, Massachusetts, have discovered that the cancer rates around the Massachusetts Military Reservation, where chemical wastes have oozed into local groundwater, are the highest in the entire state. A local mathematician, analyzing data from the state-run Massachusetts Cancer Registry, determined that one nearby town, Falmouth, had a 1986 cancer rate 38 percent above the state average. Reported cases include numerous cancers with suspected environmental causes.

People living near the Rocky Mountain Arsenal in Colorado have been exposed to a chemical soup including mustard gas and nerve agents, mercury, lead, sulfates, solvents, dimethyl sulfide, acids, methyl isobutyl ketone, dithiane oxathiane, chlorophenylmethylsulfide, sulfoxide, and sulfane. During recent cleanup operations, low-income mobile-home residents of nearby Irondale began to complain of dizziness, nausea, and vomiting. At the same installation private wells serving 140 families to the northwest of the Arsenal are contaminated with disopropyl methyl phosphonate (DIMP), a nerve gas derivative. The Colorado Department of Health has known about the contamination since 1977, but residents were only informed in 1990.

Increased exposure to hazardous chemicals is often the best, or only, explanation for the increased incidence of diseases in a particular neighborhood. Even DOD officials recognize that unless contamination is controlled, the health of significantly large populations adjacent to the bases will be jeopardized. Yet government officials, at all levels, are reluctant to admit that toxic releases from Federal facilities are responsible for identified clusters of health problems in surrounding communities.

To some degree, officials deny the effects of toxic exposure to avoid blame or liability, but it is extremely difficult prove that toxic contamination, released into the environment over a period of years, is responsible for specific health problems. Most experts agree that the study and documentation of actual health damage caused by long-term exposure to toxic substances, in the absence of environmental monitoring during the period of exposure, strains the limits of current statistical and scientific methodology.

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[19]"Poisons and the Pentagon."

Case Study: Massachusetts Military Reservation, Upper Cape Cod, Massachusetts

At many military installations, toxic contamination was discovered before it had a noticeable impact on public health. In the Cape Cod communities surrounding the Massachusetts Military Reservation, however, residents have compiled evidence indicating that military toxics have already increased local cancer rates.

Today the 21,000-acre Reservation, formerly known as Otis Air Force Base, is home to units of the Air National Guard, Army National Guard (Camp Edwards), and the Coast Guard, as well as a Veteran's Administration cemetery and a massive Pave PAWS missile-warning radar. Despite its location in the heart of picturesque Upper Cape Cod, Otis contains at least 42 toxic waste sites. One public well and at least 200 private wells in the nearby town of Falmouth are contaminated with volatile organic compounds from the base. In addition, the military for many years "recycled" hazardous waste and old munitions by burning them in open fire-fighting drills. To test fuel release mechanisms in aircraft, base personnel have dumped as much as six million gallons of aviation fuel directly on the ground.[1]

A local mathematician, analyzing data from the state-run Massachusetts Cancer Registry, determined that Falmouth has a cancer rate (for 1986) 38 percent above the state average. The five towns in the Upper Cape—Falmouth, Barnstable, Bourne, Mashpee, and Sandwich—have a combined cancer rate 21 percent higher than the entire state. Reported cases include numerous cancers with suspected environmental causes, including cancer of the lung, pancreas, bladder, kidneys, colon/rectum, prostate, and breast, as well as leukemia.[2]

The community organization, Upper Cape Concerned Citizens, originally formed to deal with noise pollution and artillery hazards around the base, placed pressure on the state to further investigate this cancer concern. Initially, state health officials tried to blame these cancers on "lifestyle" factors such as smoking and diet. The group also appealed to Governor Michael Dukakis. Demonstrations and an extensive organizing effort ensued. A leader of the group, Joel Feigenbaum, was singled out and sentenced to jail by a judge, who acknowledged that he was making "an example" of Feigenbaum to discourage future protests.[3]

Eventually, Massachusetts public health officials funded a $500,000 epidemiological study, to be carried out by the Boston University School of Public Health, to further investigate potential links between diseases and toxic exposures.

Meanwhile, the Boston-based Conservation Law Foundation took the base to court, to halt base expansion and crack down on the mismanagement of hazardous wastes. In September, 1989, the military signed a court settlement agreeing to complete an environmental review before any new construction.

In addition, the base is required to reduce the volume of waste water treated at the sewage treatment plant until treatment capacity is augmented. Base commanders must also draft plans for closing the landfill and for monitoring and rehabilitating underground storage tanks. Finally, the decree requires the base to burn munitions casings in containment vessels and to test the resulting ash for toxic chemicals.[4]

Otis was added to the Superfund NPL in late 1989. Over the last five years the Air Force has installed water lines to provide residents with uncontaminated water. At the rate the underground toxic plume is moving through the aquifer that supplies essentially all drinking water in the area, it is likely that the Air Force will have to build more and longer pipes before it even makes a "dent" in the contamination.

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[1]Seth Shulman, "Otis Base Vs. Cape Code Residents," *Science for the People,* May-June, 1987, p. 7.
[2]Tracey Minkin, "The Cape's Cancer Zone," *Bostonia,* March-April, 1989, pp. 44-45.
[3]Shulman, "Otis Base Vs. Cape Code Residents," p. 6.
[4]"The Pentagon's Toxic Legacy," *C.L. F.* Newsletter, Fall, 1989, p. 1.

Still, researchers can use existing methodology to reach general conclusions, but the Federal agency assigned the task is not yet doing its job. Congressman Gerry Sikorski (D-Minnesota), who held hearings last year on employee health and safety at government-owned Superfund sites, charged:

> A special watchdog agency, the Agency for Toxic Substances and Disease Registry [ATSDR], was created to perform health assessments at all National Priority List sites. These assessments were to be performed within a year of the date on which the sites were proposed for the list. Even though some of these sites have been listed for as many as seven years, a thorough health assessment has yet to be completed at even one Federal facility.[20]

ATSDR has only completed 41 Preliminary Health Assessments of Federal facilities on the NPL. In general, "preliminary" means that the document describes the location, summarizes some of the data that EPA used in evaluating the health risks of the facility, and assesses the need for further study. In such instances, ATSDR does not actually study health in the community; it merely summarizes the existing literature.

Where no continuing, ongoing toxic exposure is found, ATSDR often recommends against further study.[21] One reason for ATSDR's reticence in conducting health studies may be a concern that residents at sites will use government studies to strengthen lawsuits against the government. Yet, when well-researched scientific studies demonstrate that DOD is responsible for cancers, birth defects, or other serious medical disorders, fundamental notions of fairness and justice dictate that the Federal government compensate the victims. The government should not be shirking its research responsibilities to avoid paying its due.

Too Little Relief for Victims

Even when they have health studies to back up their claims, the pursuit of compensation by victims of military toxics sites is slow, costly, and difficult. The urgent needs of victims at military contamination sites are addressed neither by Superfund nor the court system .

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[20] Gerry Sikorski, "Employee Health and Safety at Federal Hazardous Waste Sites," Statement, House Civil Service Subcommittee, September 18, 1990. Though ATSDR claims to have completed "Full," as opposed to "Preliminary" Health Assessments at nine Federal NPL sites, they are anything but thorough. The "Full" report on Air Force Plant 4, operated by General Dynamics in Fort Worth, Texas, is only eleven pages long!

[21] In the case of Tinker AFB, for example, contaminated wells have been closed. ATSDR concluded, "Although there are indications that human exposure to on-site contamination may possibly have occurred, this site is not being considered for follow-up health studies at this time because no current exposure is occurring and no test is available to evaluate possible past exposures." "Preliminary Health Assessment for Tinker Air Force Base NPL Site," ATSDR, May 20, 1988, p. 13.

Confirmed victims of military toxics are not generally entitled to compensation through the Federal Superfund law. The monies in Superfund can be applied to victims' needs for relocation, alternative water supplies, health testing and cleanup around abandoned industrial facilities, but *not around Federal facilities.* When it comes to military sites, only alternative water supplies can be paid for out of Superfund. This leaves victims with little choice but to seek court remedies.

The victims often fare no better in the courts than they have in seeking remedies before government agencies. Judicial relief, which typically takes five years or more, does not address the urgent needs of victims for relocation or medical attention. As a result of the costs and uncertainties of pursuing these cases, surprisingly few make their way to the courts.

Reallocating the U.S. Workforce after the Cold War

The American investment of billions of dollars in military machinery and chemicals has employed a substantial portion of the U.S. workforce, and now, with the Cold War ending, hundreds of thousands of workers stand to lose their jobs in a military build-down. One study estimated that in the private sector from 1990-1995, 880,000 to 1,066,000 workers are likely to lose their jobs in defense-related private firms. Military industry has a large share of older workers (over age 45), as well as large percentages of minorities, women, and the less educated.[22] When laid off, these groups generally have trouble finding other jobs. When they do find work, their wages are usually much lower than in the military sector.

The decline of America's manufacturing sector makes it particularly hard for former military *production* workers to find comparable blue-collar employment. Local unemployment rates near defense contractor facilities and closed military bases are expected to soar. Unless military workers are offered desirable peacetime employment opportunities, they will likely form a powerful lobbying bloc against a true national peace dividend.

At the same time that Cold War jobs are on the decline, the country needs more people to clean up the environmental devastation wrought by both military and nonmilitary polluters over the last four decades. There is currently a shortage of qualified environmental personnel and professionals, and it's slowing the military's cleanup efforts. The DOD Inspector General's office drafted a report that explains the problem:

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[22]Families USA, Mt. Auburn Associates, and the Corporation for Enterprise Development, "The Impact of Projected Department of Defense Budget Cuts on Workers and Communities," presented to the Workshop on Defense Cutbacks and Job Training Needs," June 25, 1990.

Case Study: Rocky Mountain Arsenal, Denver, Colorado

The Rocky Mountain Arsenal, situated on the northeastern outskirts of Denver, Colorado, is one of the most polluted sites in the United States.[1] Built during World War II to manufacture chemical weapons and other munitions, the Arsenal was home to a Shell pesticide plant for three decades, as well as a U.S. Air Force rocket-fuel blending facility.

The Army has known about off-site pollution at the Arsenal since 1954, yet it allowed dangerous activities and negligent hazardous waste disposal practices to continue for decades without informing its neighbors. The chief problem today, however, is not the military's slow response to environmental degradation, but its sloppy cleanup operations. Lacking adequate funding, technology, and will, the decontamination effort has exposed workers and nearby civilians to fumes from a witches' brew of the most hazardous materials known to humanity.

The Army has already spent $222 million on studies and interim cleanup at the Arsenal. Even if cleanup is incomplete, it will cost billions of dollars. Shell, after lengthy litigation that diverted millions of company and government dollars that could have gone into environmental protection—has agreed to pay a share of cleanup costs, but the bulk of the program is being funded from the Defense Environmental Restoration Account.

Contaminants from the Arsenal have contaminated water supplies serving several nearby communities, and its proposed discharge of rocket-fuel wastes would contaminate the Barr Lake watershed, to the Arsenal's northeast.

However, by far the worst contamination on the 17,228-acre installation is at Basin F, constructed in 1956 as an alternative to leaking, unlined basins used earlier for the dumping of wastes generated by both the Army and Shell. The 93-acre basin's lining of asphalt and dirt proved no match for the solvents, pesticides, and nerve-gas derivatives disposed there through 1982. Investigators have identified at least 150 toxic compounds in Basin F, including mustard gas, nerve agents, mercury, lead, arsenic, diisopropyl methyl phosphonate (DIMP), dibromochloropropane (DBCP), solvents, and acids.[2]

In May, 1988 the Army began its assault on Basin F. First it pumped four million gallons of liquid waste from the basin into three huge double-walled tanks built by Shell. While the pumping was intended to prevent further groundwater contamination, these tanks are already leaking.

In the process of pumping, the Army exposed a sludge that, according to cleanup workers, looked like chocolate pudding. Then it excavated the soil with heavy equipment, accelerating the evaporation of remaining contaminants. The fumes released in this process wafted to the north and northwest, and soon the low-income mobile-home residents of nearby Irondale began to complain of dizziness, nausea, and vomiting. Army officials apparently considered the health problems trivial, and they offered air "purifiers" to residents who complained. Those who made a stink, so to speak, were given two purifiers instead of one.

Dissatisfied with the Army's response, the citizens of Irondale organized the Poisoned Arsenal Neighbors of the Irondale Community (PANIC) with the assistance of the National Toxic Campaign Fund's Denver office. Although Colorado Governor Romer and the state Department of Health insisted there were no long-term health threats from exposure to the fumes, PANIC demanded that the Army pay for evacuation.

Finally, at the urging of Governor Romer, the Army covered the pits before the excavation was complete. The Irondale residents filed suit, charging that the Army and Shell's negligent cleanup operation exposed their families to deadly chemicals. Meanwhile, the Colorado Attorney General refused to join the Arsenal cleanup settlement between EPA, the Army, and Shell, charging that Colorado residents are not being adequately protected.

Except for those pollutants released into groundwater and the air around the Arsenal, the poisons of Basin F remain on site. The Army has proposed and received EPA approval for incineration, but residents remain suspicious that any method of base decontamination will ignore the interests of its neighbors. Basin F requires more elaborate treatment, but the Army, already expected to spend up to $2 billion at the Arsenal—two years worth of the entire Defense Environmental Restoration Account—is unwilling to explore even more expensive alternatives.

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[1] The Arsenal should not be confused with Rocky Flats, a Department of Energy-owned facility northwest of Denver that produced plutonium triggers for nuclear weapons. Rife with toxic and radioactive contamination, Rocky Flats is another of the country's most polluted pieces of real estate.

[2] *Defense Environmental Restoration Program,* Annual Report for 1989, p. B-76.

> The Pentagon suffers from a shortage of qualified engineers, geologists, and chemists to assess the danger posed by the sites and map out a remedial action program. The report said that such technicians are in great demand by private industry and other government agencies and that turnover among military personnel working on environmental projects is extremely high.[23]

Companies providing hazardous waste services to private polluters and government agencies pay higher salaries than the civil service. They can afford to do so because they can charge what the market will bear. State and Federal agencies, on the other hand, are constrained by civil service pay scales in setting staff salaries. Yet as long as agencies suffer from staff shortages, they are forced to pay higher contractor's bills in what is already a providers' market.

Increasingly dependent upon contractors and consultants for technical analysis, planning, and management, government agencies are less capable than ever of making sure that jobs are done right. The government's reliance upon private contractors could undermine the quality, reliability, and public confidence in cleanup and oversight. The Office of Technology Assessment warned:

> Too much dependence on contractors means a lack of independent technical expertise and information in government. Improved public confidence in Superfund is contingent on the public believing that government workers, working in the public interest, know enough to solve cleanup problems.[24]

At its root, this market problem is arising because there are not enough environmental specialists in the country to meet the exploding demands for their services. The market research firm Frost & Sullivan predicts that the U.S. market for hazardous waste services will double, from $10.7 billion to $20.6 billion, between 1989 and 1994.[25]

If the Pentagon were to simply double its expenditures on environmental projects—while the pool of service-providers remained constant—it might end up getting about the same amount of work done, but at twice the cost. It clearly needs a large-scale program to increase the number of people capable of conducting the emerging cleanups. The environmental personnel shortage for government comes at precisely the same time when many experienced military and military-industrial workers need new jobs. Thus these military technologists and technicians are prime candidates to be retrained to fight the national war on pollution.

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[23]John Broder, "Report Faults Pentagon on Toxic Cleanup."
[24]*Coming Clean: Superfund Problems Can Be Solved,* Office of Technology Assessment, Congress of the United States, October, 1989, p. 43 (emphasis removed from original).
[25]"Environment Newsletter," *Chemical Week,* February 21, 1990.

Already, many private contractors to DOD and the Energy Department are attempting to shift from weapons development to environmental services.[26] This trend may expedite retraining efforts, but it remains imperative to bring individual experts into DOD staff positions instead of merely swelling the ranks of private consultants and contractors. With retraining, surplus engineers, scientists, and programmers can assist in environmental projects and receive roughly comparable status and salaries. Similarly, surplus blue-collar workers at military installations and weapons manufacturers might be offered retraining as cleanup site workers. Programs already exist to train, in one to two weeks, site workers who already have basic mechanical or construction skills. Former military employees can be put back to work immediately, cleaning up the mess that the military has made.

In general, as the U.S. military and military industry cut back, the military can ease the economic shock of peace, both to individual workers and the economy as a whole, by establishing comprehensive programs to retrain those workers and to support them while they are making the transition to new lines of work. There is ample precedent for such support, from the post World War II GI Bill to industry-wide relief efforts established during railway reorganization. The Redwood Employee Protection (REP) Program, for instance, is a Federal law which guaranteed timber workers, laid off between May 31, 1977 and Sept 30, 1980 as a result of the expansion of Redwood National Park, full salary, health and welfare benefits, and pensions. Along those lines, advocates of orderly economic transition today propose that a percentage of every current defense contract should go into a fund for retraining and support of employees made surplus by reductions of military programs.[27]

By focusing a substantial portion of a post-Cold War economic adjustment program on solving the military's need for qualified environmental professionals and workers, the Federal government can "kill two birds with one stone," attacking environmental and economic problems simultaneously.

Recovering Our Land: Base Closures and Toxic Contamination

The cleanup task becomes even more urgent as the military closes bases and transfers them to private ownership or another public agency. In 1989, Congress approved the recommendations of the Commission on Base Realignment and Closure, agreeing to the closure or partial closure of 36 bases. Although Congress has torn up Defense Secretary Cheney's 1990 list of 29 proposed base closures, it has established a new commission that will recommend many more shutdowns beginning 1991.

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[26]Michael Misner, "From Defense to Environment," *Waste Age,* June, 1990, p. 97-100.
[27]David Beers, "Brother, Can You Spare $1.5 Trillion," *Mother Jones* (July-August, 1990), p. 28.

In communities with major bases, cutting back on military operations can cause severe economic hardship. In rural areas and metropolitan centers alike, DOD is often among the largest employers. Scores of businesses cluster around bases to cater to military personnel and their dependents. Recovery comes, however, when military land is converted to civilian uses. The new civilian uses can generate as many, or even more jobs and economic activity, than was lost during closure.

However, the presence of multiple toxic pollution sites on virtually every military base is a major obstacle to reuse. If a base cannot be redeveloped, it may be practically impossible to overcome the economic loss entailed by closure. The prospect of otherwise valuable land sitting idle while former base workers seek jobs elsewhere is a political nightmare that could undermine the conversion process. Constituents may demand that Congress halt base closings. Alternatively, developers may demand that redevelopment be carried out despite the presence of contamination that threatens public health. In any event, it is clear that until cleanup is achieved, the military's toxic legacy may lock up a very substantial portion of the nation's potential real estate market.

For example, the proposed closures of the Alameda Naval Air Station and Oakland Naval Supply Center, in California, would eliminate about 11,000 civilian jobs in an area of already high unemployment. Yet those two bases sit on valuable waterfront real estate, just across the bay from San Francisco. If those facilities were redeveloped as commercial wharves, retail centers, or hotel complexes, they could employ many more workers. However, the Navy has identified at least 26 contamination sites at the two bases. Since they are not currently being cleaned up, conversion of the bases to other uses would almost certainly be delayed.

DOD has agreed to clean up its pollution at all domestic bases proposed for closure, as well as at any former bases contaminated during military operation. But the Defense Environmental Restoration Account is not large enough to fund the cleanup of sites at installations that are not on the NPL, such as Alameda or Oakland. The problem is exemplified by Hamilton Air Force Base, north of San Francisco, where the Air Force ended operations in the mid-1970's. In 1985, the General Services Administration auctioned off a 380-acre chunk to a private developer, Berg-Revoir, "contingent on the land being declared 'clean' by the State of California." Though the Army Corps of Engineers inspected the base and began feasibility studies and interim cleanup work, remedial action on a 23-acre former landfill has not begun. DERA was unwilling to spend the estimated $24 million to $60 million needed for cleanup. It stated, "Since the area presently presents minimal adverse impact to public health, monies are being used for higher priority projects elsewhere."[28] It took a direct act of Congress in 1990 to allocate $17 million for cleanup of the sale parcel at Hamilton.

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[28] *Status of EPA Negotiations on Interagency Agreements*, p. 99.

Officials at hundreds of other installations which are contaminated but not on the NPL are in the same difficult situation. (However, despite their low priority, DERP reports that some degree of remedial study or action is underway at 580 non-NPL sites.) Until 1990, when Congress specificially appropriated cleanup funds for bases undergoing closure, officials at non-NPL bases scheduled for shutown could do little more than initiate studies with a hope for cleanup funding at some future, unspecified date.

EPA officials agreed with DERA, arguing that bases undergoing closure should not be moved to the front of the cleanup line. They argued that priorities should be based solely upon the threat to public health and the environment posed by individual sites.

Obviously, those should be the primary criteria. However, assuring cleanup at bases undergoing closure would ease the political pressure against base closure and reduce the chance that bases might be redeveloped before they are cleaned up. Further, by encouraging the careful reuse of the bases, swift action would lessen economic hardship. In these situations, where the families of laid-off base workers cannot afford decent housing or medical care, rapid economic conversion of base property may be necessary to prevent the deterioration of public health and the local community.

At the urging of Rep. Vic Fazio (D-Sacramento), Congress adopted this point of view in late 1990. It voted $100 million for base closure cleanup in fiscal year 1991, setting a precedent for similar appropriations in successive years.

Still, the need to avoid unnecessary development delays poses policy questions, even on the ostensibly clean sections of large bases slated for closure. The district of Congressman George Brown (D-southern California) contains Norton Air Force Base, a military NPL site undergoing closure. In 1989 Brown asked, "If contamination is restricted to a small portion of the base, can the remaining property be sold to the community, or to the private sector? And how will long-term remediation—such as a pump and treat facility—affect the sale of the property." His colleague, Lee Hamilton (D-Indiana), said, "The Base Closure Commission's executive director, Hayden Bryan, has stated, `If you've got a problem on a base that's going to be closed, throw a fence around it and clean it up later.' That has to be a new low in terms of civic responsibility."

If large bases are to be broken up for sale and redevelopment, clear standards are needed to protect public health while allowing conversion to new uses to proceed.

Recommendations

The massive mobilization of U.S. troops into the Middle East in 1990 indicates that America has the ability to move large numbers of personnel quickly This type of mobilization is needed, at home, to save America's environment from the assault from within by past military practices. Therefore, we recommend the following:

1. NTCF supports legislation to increase the military budget for environmental restoration. Funding should be based upon a realistic assessment of the cost of identifying, investigating, and cleaning up contaminated military bases. Mid-level Pentagon personnel who recnognize those needs, as well as the DOD Inspector General's office, should be allowed to testify directly and frankly to Congress.

2. NTCF calls for the establishment of a **Defense Environmental Compensation Fund**, with its own, one-stop administrative system, to meet the urgent compensation needs of people whose health and property have been harmed by military contamination. These monies should be made available administratively, i.e. without the need for victims to sue to obtain them, for victims' most urgent needs such as medical care and screening, replacement water supplies, and relocation. Victims recourse through this fund should not preclude later recourse through the courts.

3. A **Defense Environmental Retraining Program**—a new version of the "GI Bill"—is needed to ease the conversion of the nation's labor force to a peacetime, environmentally sound economy. Funding should be provided for retraining and transitional support for both military and contractor employees. The program should retrain these employees for cleanup, research and development, or other "environmental security" work.

4. Congress should continue to specify funds for cleanup at bases slated for closure. Congress, DOD, and EPA should work with state and local government to establish clear environmental policies for the reuse of former military property, including the following:[29]

   a) **Cleanup standards.** Cleanup technologies should not be based upon currently proposed land uses. That is, the military should not be permitted to achieve incomplete cleanup merely because under the proposed redevelopment

[29]In 1990 the California legislature adopted Assembly Concurrent Resolution 166, authored by Democratic Assemblyman Richard Polanco, calling for the state Department of Health Services to hold workshops and develop policies embodying these principles by July 31, 1991. Since California leads with nation in base closures, with five major facilities undergoing closure and another nine proposed—and then postponed—in 1990, the California policies may serve as a national model.

plan—an airport, for instance—contamination would place few people at direct risk. Rather, a high standard, allowing for a wide range of uses, should be applied.

b) **Timetable.** No portion of a military installation listed by the Defense Environmental Restoration Program should be sold or transferred before a thorough investigation of all contiguous base property is completed. No development should impede continuing investigation or cleanup at the base.

c) **Buffer Zones.** Buffer zones, based upon minimum distances determined by health officials, should separate inhabited buildings from surface (and near-surface) contamination, treatment facilities, and monitoring wells. The size of these zones should vary based upon the nature of contamination. Certain environmental hazards, such as capped hazardous waste landfills, radiation deposits, and active incinerators may require larger buffer zones than the bases upon which they are located, thus precluding redevelopment.

d) **Notification.** All contaminated surface sites, treatment stations, and monitoring wells should be fenced off and posted with appropriate warning messages. All deeds covering the sale of property and rental agreements/leases signed for property originally part of the military installation should notify buyers and renters that the installation was/is listed as a hazardous waste cleanup site, and the notice should explain where to obtain additional information. This requirement should cover even those portions of the installations which are not directly contaminated.

Chapter 2

The Wastes of War Continue to Mount

Fifteen thousand points of blight at military bases around the U.S. demonstrate clearly that past environmental practices of the military have been negligent and reckless. Yet the military's *current* waste management practices continue to jeopardize the environment. Prompt and effective action must be taken to reduce the military's day-to-day generation of hazardous wastes, and to bring disposal practices into line. Otherwise, more military Superfund sites will be created, requiring billions of dollars for additional cleanup in the future.

Today, the military is among the nation's largest generators of hazardous wastes and other toxic materials. Yet the Pentagon does not even have a good handle on where and how much waste it generates. Waste management practices remain primitive and dangerous at many locations. Many military installations are violating federal and state environmental laws. The number of violations actually detected is only the tip of the iceberg, since the EPA lacks both the staffing and the clear authority needed to rigorously oversee DOD environmental practices. DOD has objected to legislation giving EPA and state regulators greater clout, apparently hoping to maintain the present situation, in which no one is guarding the environmental fort.

Although Congress is gradually applying more stringent budgetary reporting standards, the Pentagon has no overall picture of its own environmental programs. Cleanup funding has been centralized in the Defense Environmental Restoration Program, but the Pentagon has no clear idea what is actually spending on hazardous waste treatment, storage, and disposal, on compliance with the Clean Air Act, or on wastewater treatment. It is difficult, therefore, for policy-makers, within and outside the DOD, to set environmental priorities or reach general conclusions about the armed services environmental record. Though the actual implementation of pollution controls is most cases inextricably linked to the operation of a military facility, and thus should be funded as part of such programs, DOD should compile and assess environmental spending in a detailed public report each year.

In preparing our review of the current waste management practices of the U.S. military, the National Toxic Campaign Fund worked with Public Data Access, New York, to create the most exhaustive public database on military toxics ever compiled. This new information source provides the first comprehensive public interest review of toxics problems at Defense Department Installations.[30]

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[30] The methodology for this review, which included dozens of Freedom of Information Act requests and hundreds of computer programming hours, is described in a separate report : Benjamin A. Goldman, "The

Toxic Waste "Missing in Action" at DOD?

When Congress passed the Community Right to Know Act in 1986, it set forth detailed requirements for polluters to disclose their toxic chemical pollution, and also to provide information needed for the government to conduct emergency planning for chemical accidents. The disclosure of toxic pollution information, compiled by EPA as the Toxic Release Inventory (TRI), allows concerned citizens to learn how much toxic waste is being emitted to local air, water, and land by America's big industrial polluters. Unfortunately, Congress failed to require facilities operated by Federal agencies to comply with the law.[31] Despite this omission, the EPA Administrator requested that Federal agencies voluntarily comply with the Toxic Release Inventory provisions of the Act.

In July, 1987, however, DOD issued a policy directive instructing the armed services to comply with the emergency planning provisions, *but it did not require its components to submit data for the Toxic Release Inventory*. Consequently, none of the armed services have submitted TRI data.[32]

At least one sponsor of the Community Right to Know Act is urging his colleagues to correct their oversight. Congressman Gerry Sikorski (D-Minnesota) said:

> In 1986, I sponsored the Community-Right-to-Know legislation that became part of Superfund. Even though Federal facilities were pragmatically exempted from the reporting requirements of this act, we can no longer allow Federal facilities to escape the law. Federal employees, and the communities in which they live, deserve immediate implementation of an effective, far-reaching health assessment and coverage under Community-Right-to-Know.[33]

Congress should go a step further, clarifying that all military facilities, not just those engaged in manufacturing, that release substantial quantities of toxic materials into the environment, should submit data to the TRI. In fact, they should be required to include information about the release of toxic wastes from rockets, aircraft, ships, and other vehicles under their control.

Lacking the guidance and unifying force behind the TRI reporting requirement, there has been no unified reporting of military toxic releases. Instead, the regulators

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Military's Toxic Accounts: A Review of Government Data on Military Pollution," Public Data Access, August, 1990. This report may be ordered from the National Toxic Campaign Fund.

[31]However, government-owned industrial plants that are operated by private contractors are subject to the law.

[32]"Summary Report of Federal Agency Title III Programs," Interim Final Report, Environmental Protection Agency, Office of Federal Activities, EPA/130/9-90/0001, February, 1990. See especially pp. 1-3.

[33]Sikorski, "Employee Health and Safety at Federal Hazardous Waste Sites."

and the public have been presented with Pentagon waste generation figures that are more like "guesstimates" than the hard numbers that such a serious issue demands.

In 1989, in its Defense Environmental Status Report (DESR), DOD reported generating 876 million pounds of concentrated solid and liquid toxic wastes.[34] However, the DESR contains no site-specific information, so the data cannot be cross-checked or applied to particular sites. Even worse, DOD's own environmental staff considers the DESR estimates unreliable, and they may stop collecting the numbers in the future.[35]

DOD's lack of credible waste accounting procedures make the DESR figures speculative, at best. When the General Accounting Office (GAO) sought to determine how the military measured its generation of hazardous waste, it found scandalously wide discrepancies. For instance, the Air Force Logistics Command reported an improbable twelve-fold increase in hazardous waste generation in one year, from about 190 million pounds in 1986 to 2.3 billion pounds in 1987.[36]

GAO found that inconsistent accounting practices from base to base result in some wastes being left out of calculations entirely. Personnel at the Sunflower Army Ammunition Plant in Kansas identified none of the plant's excess hazardous materials as waste, assuming incorrectly that the Defense Reutilization and Marketing Service (DRMS) would classify and report waste that it received from Sunflower.[37]

DRMS, which received 178 millions pounds of hazardous waste in 1989—about a third of the half billion pounds of hazardous waste that the Pentagon reported sending off-site—does not accurately track those wastes. Much of DRMS's failure stems from its original function, which has always been to transfer unnecessary military equipment to "Army-Navy surplus" wholesalers. Like other wholesalers, DRMS uses many units to measure its merchandise. Some, such as gallons, drums, and liters, are roughly convertible, and can be used to develop estimates of volume or weight. However, many other units—such as cartons, kits, and each—provide no useful information to managers who should be keeping close track of waste streams.

Other waste accounting practices noted by GAO at the military bases themselves add a wide margin of error to waste calculations. At several sites, military personnel routinely assumed, without careful inspection, that 55-gallon drums were full, or that the wastes in drums were liquid. Furthermore, different Air Force bases utilize inconsistent ratios to convert from gallons to pounds and kilograms to pounds.

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[34]This includes 15 million pounds of PCB's (polychlorinated biphenyls) and 15 million pounds of used oil.
[35]Benjamin Goldman telephone interview with Patricia Jansen at DOD, June 25, 1990.
[36]"Hazardous Waste: DOD Efforts to Reduce Waste," General Accounting Office, GAO/NSIAD-89-35, February, 1989, p. 30. GAO explained, "Data generated by the Air Force for 1987 reflects gross generations, which includes reclaimed, recycled, and reused chemicals and wastewater that is subsequently treated and removed prior to disposal."
[37]*Ibid.*, p. 27.

Since the press, investigative agencies, and Congress discovered DRMS's incompetent handling of hazardous waste, the agency has taken steps to improve its operations. Reportedly it now measures all hazardous wastes in pounds. It now mandates hazardous waste training for staff involved in that aspect of its operations.

As bad as things are under DRMS, at least this agency constitutes a centralized data management point for waste streams. In contrast, there is no central management system for the other two thirds of the hazardous waste that the military sends off site—370 million pounds estimated in 1989.

When it comes to management of toxics in wastewater, the available information is almost useless. In its internal documents, DOD acknowledges discharging 16.6 billion pounds of bulk hazardous wastewater in 1989,[38] but in their reports to regulatory agencies, 51 of about 400 permitted DOD facilities reported discharging a total of 2 million pounds of toxic contaminants. Two of those facilities also reported discharging 34 million pounds of chlorine. Neither the national total of bulk discharges nor the selective reporting of specific contaminants provide policy-makers or regulators with a clear picture of the military's water pollution record.

The Defense Department, working with regulatory agencies such as EPA, must develop systems for collecting, standardizing, and disclosing its current practices for waste management and disposal. Without such systems, it cannot properly budget funds and personnel to implement its existing policies, nor attain goals, such as conforming to regulatory standards or reducing the generation of hazardous wastes. Without such information, the EPA, the states, and Congress cannot properly exercise their oversight functions. Until such data is compiled and made available, the public will remain in the dark about the extent of continuing military toxic pollution in their communities.

Temporary Storage Threatens the Environment

The massive volume of waste generated by DOD results in a formidable problem of waste management. Before the wastes can be treated or disposed, they are often stored at the site of generation for an extended period. Of 1,345 hazardous waste-generating facilities within DOD, more than 130 have EPA permits to store hazardous wastes for more than 90 days. The military has a long history of improper storage of wastes, particularly at unauthorized, unpermitted storage sites. As recently as June, 1990, a GAO investigator told Congress that the military still does not have adequate facilities, and "that thousands of damaged and leaking containers are stored

[38]"Defense Environmental Status Report for 1989," Department of Defense, June 1990, Table 6B.

Case Study: Jefferson Proving Ground, Indiana

The Jefferson Proving Ground (JPG), a U.S. Army munitions test range in southern Indiana, stands as a testimonial to the environmental menace of conventional modern warfare. The JPG contains similar hazards to those found at other military bases underground—storage tanks, disposal sites, etc.—but its biggest problem is unexploded artillery shells. Removing those weapons to allow the unrestricted future use of JPG could cost over $5 billion. The cost of restoring active bombing and artillery ranges elsewhere would be similar, but the Pentagon is not assessing those costs because JPG is the only major range undergoing closure at this time.

The Army established JPG, a 55,264-acre finger of land jutting north from the Ohio River community of Madison, just before World War II. Though portions are used for the testing of aerial bombs and land mines, its primary function is to test artillery rounds, weapons designed to explode upon impact. While some of the early records are sketchy, the Army reports that **23 million rounds have been fired since 1941.** Approximately six percent have failed to explode; they lie as far as 25 feet underground. Those "duds," as well as nearly 5 million other potentially explosive devices, may be found anywhere on the 51,700 acres north of the base's firing line.

The installation was mothballed and reopened twice: after World War II, and then again after the Korean War. In 1989, however, the Commission on Base Realignment and Closure recommended that JPG be **permanently** closed. Since Congress approved the Commission's all or nothing national package of recommendations, the Army is moving JPG's remaining artillery proving operation to Yuma, Arizona. JPG will be closed by 1995.

Restoring and reusing the non-impact areas, which contain insecticides, herbicides, PCB transformer oil, asbestos, fuels, and solvents, is likely to cost tens of millions of dollars. Opening the vast expanse north of the firing line, however, would be technically difficult, astronomically expensive, and a potential environmental disaster.

Unexploded munitions at old test ranges pose a direct and lethal threat to the public. At the end of World War II, the Army said it could not open JPG to farming because plows might strike and detonate active shells. This is exactly what happened in Arkansas, where a similar facility was transferred to private ownership. Also, in 1983, two children were killed when they uncovered an old shell in the Tierrasanta neighborhood of San Diego, California, built over the site of Camp Elliot.

As old weapons decompose, their chemical constituents enter the environment posing potential toxic contamination hazards. In addition, armor-piercing shells made of depleted uranium, are releasing low levels of radiation, including radon gas. Approximately 19,000 uranium shells were fired at a 400-acre target in the center of JPG.

The size of JPG makes it difficult to find viable solutions. While the Army can minimize risk by keeping the area fenced off, it is difficult to keep everyone out of such a large wooded area, portions of which are teeming with game. Even now, with an active security program, poachers trespass in the northwest corner of JPG.

Clearing shells from the site would reduce long-term contamination, but it would destroy the remains of JPG's ecosystem. An Army spokesman said, "We'd have to rape the land of all vegetation, remove the dirt with armored equipment, sift it, and put it back."[1]

Depending on whether the Army opts for selective cleanup (ignoring unexploded munitions) or a full restoration (removing munitions to the depth of ten feet), the cost of coping with JPG's unique hazards could range from $100 million to over $5 billion.[2] Even the low figure would use up all the funds in the base closure cleanup budget.

The environmental risks from JPG will have to be addressed eventually. It makes sense for the military to determine now how it might limit environmental degradation from this site as well as other ranges where bombing and artillery testing are still taking place.

The more costly portions of cleanup are likely to be put off for years until funding is made available. Given the tremendous costs involved, it is quite possible that JPG, like other massively contaminated military sites, may never be cleaned up. If that is the case, Indiana residents may be forced to "write off" a large tract of their state as a "national sacrifice zone," sabotaged for all time in the name of national defense.

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[1] David Evans, "Army Facility Clean-up a Minefield of Problems," *Chicago Tribune,* April 23, 1990, p. 11.

[2] "Report to the Governor: U.S. Army Jefferson Proving Ground Evaluation," Indiana Department of Environmental Management, April 20, 1988; "Environmental Brief," Directorate of Engineering and Housing, Jefferson Proving Ground, May 2, 1989.

in open sheds where spillage is allowed to run off onto the ground and containers are susceptible to wind, rain, snow and extreme temperatures."[39]

Over the past ten years, the Pentagon has been moving slowly to rectify this waste storage danger. In 1980, the Pentagon assigned responsibility for hazardous waste storage and disposal DRMS. Then known as the Defense Property Disposal Office, this branch of the Defense Logistics Agency drafted a plan to construct 143 container storage facilities at U.S. military bases throughout the world, in conformance with Federal hazardous waste law.[40] By February, 1985, it had built 12, and an additional 13 were under construction. In its fiscal 1985 budget request, DRMS requested funding for construction of 100 conforming storage locations. Many of the locations proposed to be constructed on the 1988 list were reproposed in the fiscal 1990 budget request.[41] The military blames the ten year delay in ending its dangerous storage practices on the appropriations process and on delays in EPA permitting. In the meantime, barrels of waste continue to leak to the environment, threatening to create more Superfund sites at military bases across the country.

On-Site Disposal Dangers

The military's most challenging cleanup problems result from the negligent disposal of hazardous chemicals in the past. Hazardous wastes had been combined with other garbage and buried at "sanitary" landfills. Drums containing dangerous materials had been left to rust in open fields. Poisonous liquids had been dumped on the ground, poured into streams, or even channeled into permeable lagoons.

New regulations technically preclude the continuation of these past, neglectful practices. Instead, "regulated" treatment and disposal practices are being employed for most wastes. The Pentagon says it operates 49 hazardous waste land disposal facilities (toxic dumpsites), 16 hazardous waste incinerators, and 79 hazardous waste treatment facilities scattered across the country.[42]

Unfortunately, these new practices and facilities are not so safely and effectively managed that Americans can truly rest assured that local bases now present no threats. In fact, most of the government-owned land disposal facilities have been in

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[39]Norman Rabkin before the Subcommittee on Environment, Energy, and Natural Resources, House Government Operations Committee, as reported in John Broder, "Army Use of Toxic Chemical Scored," *Los Angeles Times,* June 29, 1990.

[40]The primary Federal law governing the treatment, storage, and disposal of most toxic wastes is the Resource Conservation and Recovery Act (RCRA).

[41]*Military Construction Appropriations for 1988,* Hearings, Subcommittee on Military Construction, House Appropriations Committee,part 4, pp 412-413; *Military Construction Appropriations for 1990*, Hearings, Subcommittee on Military Construction, House Appropriations Committee,part 2, pp 220-221.

[42]See Appendix 4 for a list of DOD toxic land disposal facilities and Appendix 5 for a list of DOD hazardous waste incinerators.

significant *noncompliance* with the Federal hazardous waste law, RCRA. What is worse, even compliance with government regulations does not ensure public or environmental safety.

Of 200 military facilities inspected in 1989 by EPA or its state counterparts for compliance with RCRA's hazardous waste management and disposal requirements, 156 were counted as violators. While some violations were minor or administrative, often they represented serious environmental threats.

In 1987, EPA listed 31 of 47 military land disposal facilities sites as having failed to address RCRA violations.[43] In 1989, DOD reported on the status of 31 installations which EPA had identified as RCRA "significant noncompliers" at the beginning of fiscal year 1988. The noncompliance episodes at eight of the facilities were still entirely unresolved, while most of the other facilities were at or near to reaching agreements with state or Federal officials setting forth timetables for coming into compliance.

Off Site and Out of Mind

In 1989, the armed services directly managed—that is, they didn't route it through DRMS—an estimated 370 million pounds of waste that they did not treat or dispose of on site, including bulk wastes, such as sludges from treatment plants, and biological materials. NTCF's research was unable to ascertain what portion of these wastes were shipped to privately-owned treatment and disposal sites, and how much was shipped to military-owned treatment and disposal facilities at other installations.

Some was handled illegally. For example, at least 33 drums of toxic sandblasting waste were illegally dumped at the county landfill in San Bernadino County, California, in early 1989. The waste, produced when tanks and other military vehicles were sandblasted for repainting at the Barstow repair facility of the U.S. Marine Corps Logistics Base, contained high levels of lead and other carcinogens.[44]

Even waste handled by the Defense Reutilization and Market Service is often handled improperly. Since the Pentagon assigned DRMS responsibility for off-site hazardous waste disposal in 1980, it has performed poorly. In 1984, for example, DRMS found that it had a backlog of nearly 11,000 separate line items awaiting disposal, 28 percent of which had been in temporary on-base storage for more than six months, and 9 percent of which had been awaiting pickup for more than a year.[45]

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[43] *Environmental Compliance by Federal Agencies,* pp. 490-491, 840-853.

[44] *Los Angeles Times,* printed in *San Francisco Chronicle,* November 28, 1989.

[45] GAO explained that a line item could be the waste in a one-pound container, 100 55-gallon drums, or a 25,000 gallon tank. "Hazardous Waste: DOD's Efforts to Improve Management of Generation, Storage, and Disposal," U.S. General Accounting Office, GAO/NSIAD-86-60, May, 1986, p. 32.

TABLE 3
PRIVATE CONTRACTORS PROVIDING OFF-SITE DISPOSAL OF MILITARY HAZARDOUS WASTES DURING 1989

RANK	COMPANY	HAZARDOUS WASTE DISPOSED (POUNDS)	COST
1	GSX GOVERNMENT SERVICES INC.	19,424,293	$9,758,501
2	CHEMICAL WASTE MGMT INC	13,622,557	$5,651,693
3	TRICIL ENVRN MGMT INC	29,099,065	$5,343,813
4	U S POLLUTION CONTROL INC	12,927,804	$3,375,120
5	NORTHWEST ENVIROSERVICE IN	11,025,236	$3,207,782
6	ROLLINS ENVIRONMENTAL SVCS	7,331,578	$1,615,820
7	CTA ENVIRONMENTAL INC	3,754,251	$1,053,068
8	NATIONAL ELECTRIC (APTUS)	2,978,172	$919,866
9	MOHEAT INC	1,434,688	$573,013
10	--CONTRACTOR UNKNOWN--	1,505,356	$373,483
11	M P VACUUM TRUCK SERVICE I	706,428	$370,455
12	GENERAL ELECTRIC COMPANY	692,588	$306,865
13	AMERICAN ENVNMNTL SVCS INC	1,547,169	$257,252
14	NORTH AMERICAN ENVIRONMENT	276,291	$226,255
15	ENVIRO-CHEM WASTE MGMT SVC	428,972	$198,787
16	WASTE CONVERSION INC	552,483	$163,886
17	CHEM CARE INC	342,797	$127,837
18	WHY WASTEWATER INC	143,182	$68,546
19	ENVIRONMENTAL DYNAMICS INC	107,093	$53,522
20	NEW ENGLAND IND WASTE INC	121,903	$51,324
21	TERRA FIRST INC	142,280	$12,450
22	SAFETY-KLEEN ENVIROSYSTEM	506,220	$11,505
23	ENSCO ENVIRONMENTAL SERVIC	7,951	$5,420
24	CHEM-CLEAR INC	484	$151
	TOTAL	108,678,841	$33,726,414

NOTES: (1) Includes only wastes for which the Defense Reutilization and Marketing Service contracted disposal; installations contract directly with commercial firms for two-thirds of off-site disposal, but there is no centralized source for such information. (2) Includes 2.7 million pounds of waste, costing $1.4 million to dispose, that DRMS received from non-military federal facilities, primarily the Coast Guard.

For this reason, many installations directly signed contracts with firms to haul and dispose of waste off base.

In 1989, DRMS received 178 million pounds of hazardous wastes from the armed services. It paid contractors $33.7 million for shipping and the off-site disposal of 106 million pounds, but the agency's disposal records don't tell the whole story. It sold, donated, or recycled the rest. The DRMS disposal database does not specify exactly where the other 72 million pounds went, but journalists and Congressional investigators have determined that substantial amounts were transferred improperly.

In 1989, for example, TV news investigators discovered that DRMS was selling extremely hazardous materials along with other military surplus in mixed lots to unsuspecting or uncaring wholesalers. Drums containing such surplus toxics have turned up as abandoned hazardous waste in several parts of California.[46] Since then, under fire from Congress and the press, DRMS has centralized its control of hazardous materials transfers.

While it may make sense for the Pentagon to sell commercially valuable, unused hazardous materials, decisions about the safety of such transfers should rest in an agency where environmental issues, not the wholesaling of surplus goods, are the primary responsibility.

Similarly, the recycling of used solvents—now carried out by DRMS and numerous local commands—should be supervised by a DOD environmental agency, if allowed at all. The burning of solvents as fuel releases hazardous air emissions, due to the incomplete combustion of the materials. (See Chapter 3.)

The storage and management of hazardous waste does not belong in the careless hands of an agency whose primary responsibility is the sales of surplus property. It belongs, along with the Installation Restoration Programs, under the control of a Pentagon environmental office, an organization run by individuals with environmental experience and expertise.

It may be just a matter of time before DRMS loses its hazardous waste disposal portfolio. The agency is under fire from all directions. For instance, in 1988, Maine's Attorney General James Tierney called on Congress to investigate DRMS, complaining that base commanders did not have effective control over RCRA-regulated facilities on their bases.

Even the private waste disposal industry, not exactly known for its environmental conscience, has trouble working with DRMS. Two of the nation's biggest waste management firms, Rollins Environmental Services and Chemical Waste Management, testified that they stopped bidding on DRMS contracts, although other contractors still deliver wastes to their facilities. Rollins, the nation's leading

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[46]"Let's Make a Deal," *Prime Time Live* (ABC), September 28, 1989.

operator of toxic waste incinerators, says that DRMS personnel frequently misidentify waste. Chemical Waste Management, the nation's largest hazardous waste facility operator, also complains that DRMS, in selecting low-price bidders, has built up a third-party waste-broker industry which has little control over liability and waste tracking. In addition, Chemical Waste Management charges that DRMS's vague descriptions of waste and inaccurate quantity estimates invite artificial, unenforceable low bids.[47]

Finally, in late 1990, Congress called for a thorough review of DRMS hazardous waste disposal operations. The Senate Subcommittee on Defense Appropriations Congress concluded:

> The Committee believes that too much recyclable hazardous waste/material may be summarily disposed of as hazardous waste and too many [DRMS] handled sales and donations may result in illegal storage and disposal incidents that tangle the generating command, [DRMS], and the regulatory community in complicated cleanup and removal actions.[48]

Clean Water: Not Clean Enough

Under the Clean Water Act, all Federal facilities discharging pollutants into U.S. waterways are required to obtain permits from the EPA's National Pollutant Discharge Elimination System (NPDES). About 150 Federal facilities, including 107 DOD installations, are considered major NPDES dischargers, while 265 more are minor dischargers. At least 93 of the major Federal dischargers treat industrial sewage, and many treat both industrial and domestic waste.[49] Each year DOD discharges almost 17 billion pounds of wastewater from NPDES treatment plants.

The GAO recently found that on average about 22 percent of DOD's major dischargers were violating the Clean Water Act in any given quarter, compared with a 15% rate among other Federal facilities and a 10% violation rate among major private industrial facilities. Many, but not all, violations involve toxic substances, including unpermitted releases of cyanides, acids, metals such as cadmium, chromium, zinc,

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[47]Testimony of Rick Yates of Rollins Environmental Services and Patrick McCann of Chemical Waste Management before the Environmental Restoration Panel of the House Armed Services Committee, April 4, 1990.

[48]"Department of Defense Appropriation Bill, 1991," Senate Report 101-521, October 11, 1990, p. 37. In fiscal year 1991 legislation, DRMS is referred to as the Defense Reutilization and Materials Organization (DRMO).

[49]*Overview of DOD Environmental Activities,* Hearings, Environmental Restoration Panel, House Armed Services Committee, April 26, 1989, p. 179. In the same hearings, DOD provides three different totals for its major NPDES permits, ranging from 88 to 132. It also has somewhere around 250 minor permits.

Case Study: Cherry Point Marine Corps Air Station, North Carolina

Even as officials at some bases take steps to clean up after past mistakes, hazardous wastes continue to be released into the environment. This is the case at the Marine Corps Air Station at Cherry Point, North Carolina, an 11,700-acre installation in operation since 1942.

For many years, Cherry Point dumped untreated or inadequately treated industrial wastes into nearby creeks. Today, sediment from Slocum Creek, where the base discharges its waste, contains high levels of at least ten metals, including cadmium, mercury, chromium, and lead. Fish taken from the creek show elevated metal concentrations.

The Marines blame the creek's pollution on past practices, such as pouring industrial wastes down drains and releasing plating-shop rinsewater into the base-operated sewage system. These practices were supposed to have been corrected after the EPA cited the old electroplating shop for RCRA violations in 1987. But metal wastes still enter the creek.

To determine how to dispose of increased industrial waste expected when a new electroplating shop opens at the base's Naval Aviation Depot, Cherry Point officials approached the state Division of Environmental Management (DEM). DEM officials suggested that Cherry Point move its sewage outflow to the Neuse River, into which Slocum Creek flows. The Marines complied with the suggestion, filing for a permit to discharge into the Neuse River. They also asked to be allowed to discharge much more of seven toxic metals, including a 1030% increase in cadmium releases, a 1680% increase in chromium releases, and a 940% rise in nickel discharges.[1]

However, 150 local opponents of the permit showed up at a public hearing, arguing, in a refrain heard in many parts of the country, that "the solution to pollution is not dilution." Among the opponents of the permit were a state toxicologist, a waterfowl biologist from the N.C. Wildlife Resources Commission, a University of North Carolina marine geologist, and a research team from East Carolina University's Medical School and Geology Department. The North Carolina Coastal Federation also testified against the new outfall, warning that it could threaten the recreational use of the river, lead to the bio-accumulation of toxic metals, and create irreversible damage to the Neuse River. The state is still considering the permit request.

In addition to polluting surface water, Cherry Point, "is contaminated by hazardous wastes disposed of in unlined landfills, surface impoundments, and land-treatment units."[2] Two on-base drinking-water wells were shut down after high levels of benzene were found there, and the U.S. Geologic Survey has identified very high concentrations of TCE and dichloroethylene at monitoring wells."

In late 1989 the Navy signed a precedent-setting "corrective action" agreement under RCRA to investigate and decontaminate the base. EPA, it appears, used the plating shop's noncompliance as leverage to deal with past practices.

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[1] Letter from Dr. Stanley Riggs, (East Carolina University Geology Department) *et al* to Dr. George Everett, North Carolina Division of Environmental Management, April 10, 1990.

[2] "EPA, Navy Approve First Agreement for RCRA Cleanup at Military Base," *Hazardous Waste News,* December 11, 1989, p. 484.

and copper, and phenol.[50]

The Navy has a particularly bad record. During a two-year period, at least 65 percent of its major permitted installations were out of compliance with priority NPDES program requirements for at least one quarter. For example, the Norfolk (Virginia) Naval Shipyard, older than the United States itself, remained out of compliance for nine months because it discharged high levels of copper, zinc, and chromium, as a result of malfunctioning equipment.

Shipyards face unique problems in controlling wastes from the visiting ships, which are often responsible for noncompliance at shipyards. Shipyard personnel have no direct authority over ship personnel, and ship crews are accustomed to discharging wastes, with little or no treatment, at sea.[51]

NPDES is enforced by state officials in 31 "delegated" states and by EPA elsewhere. Regulators generally believe they have the tools to enforce compliance. Virginia officials took the Norfolk shipyard to court in March, 1987, and within four months the Navy had corrected all significant violations.[52]

Clean Air and the DOD

As of February, 1990, the EPA listed 15 Federal facilities, including 13 DOD installations, as significant violators of the Clean Air Act.

Until now, agencies implementing the Clean Air Act have focused regulation primarily on "conventional" air pollutants such as smoke and smog-producing compounds. Before the passage of the 1990 Clean Air Act, only seven toxic chemical air pollutants were regulated, but most enforcement agencies are not equipped even to monitor releases of those substances.

The 1990 Clean Air Act extends controls to over 200 hazardous air pollutants. The military, like other large users of industrial chemicals, will have to pay the price of compliance. Although it has not released any studies, the DOD has told Congress that it will need to invest $4.45 billion to meet the new law's restrictions on hazardous air pollutants.[53] This figure, in the absence of any TRI data from the military, indicates that the military's current toxic emissions are widespread.

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[50]Taken from case studies at four bases. "Water Pollution: Stronger Enforcement Needed to Improve Compliance at Federal Facilities," GAO/RCED-89-13, December, 1988, pp.68-70, 72.
[51]*Ibid.*, pp. 27-28.
[52]*Overview of DoD Environmental Activities,* p. 183. The Navy says that it began to comply even before the suit was filed, p. 225.
[53]*Ibid.*, March 15, 1989, p. 11.

The launching of test rockets by and for the military is an important source of air pollution. Solid rocket motors emit aluminum oxide particles, chlorine, and hydrogen chloride (HCl) gas. These pollutants can cause irritation immediately upon exposure, as well as serious chronic illness. [54]Chlorine and hydrogen chloride are mutagenic, and they are regulated for the first time by the Clean Air Act of 1990.

Each test of NASA's Advanced Solid Rocket Motor, planned to begin in early 1993 at the Stennis Space Center on the Mississippi Coast, is expected to release 430 thousand pounds of aluminum oxide, 31 thousand pounds of chlorine, and 254 thousand pounds of hydrogen chloride—the chemical equivalent of 800 thousand pounds of aqueous hydrochloric acid. Since the annual threshold for controlling chlorine and HCl emissions is 20 thousand pounds, NASA, which operates the Stennis Center, will be required to reduce those emissions; however, thus far its only ideas are to deflect the pollution high into the air and to fire the engines only when the wind is likely to disperse emissions.[55]

The military is also an important source of ozone-depleting chemicals, substances that break down the layer of the upper atmosphere that protects the Earth from deadly ultra-violet solar radiation. For example, the military and its contractors accounted for half of the 150 million pounds of ozone-depleting CFC-113 (Freon) used as an industrial solvent in 1986. In 1988, major military contractors were responsible for 55 percent of the CFC-113 releases reported by manufacturers in Florida. In 1986,, the Navy and Air Force accounted for 16% of the combined U.S. emissions of two other ozone-depleting chemicals, Halon 1211 and Halon 1301.[56]

EPA and States Lack Clear Enforcement Powers

The EPA states that "Federal facilities must comply both procedurally and substantively with RCRA and CERCLA in the same manner as any non-Federal entity."[57] However, the DOD, the Energy Department, and the Department of Justice

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[54]For more on rocket toxics, see Lenny Siegel, "No Free Launch: The Toxic Impact of America's Space Programs," National Toxic Campaign Fund, August, 1990.

[55]Sharon Ebner, "NASA Studies Ways of Reducing Pollution from Test," *The SunHerald* (Mississippi), February 11, 1990.

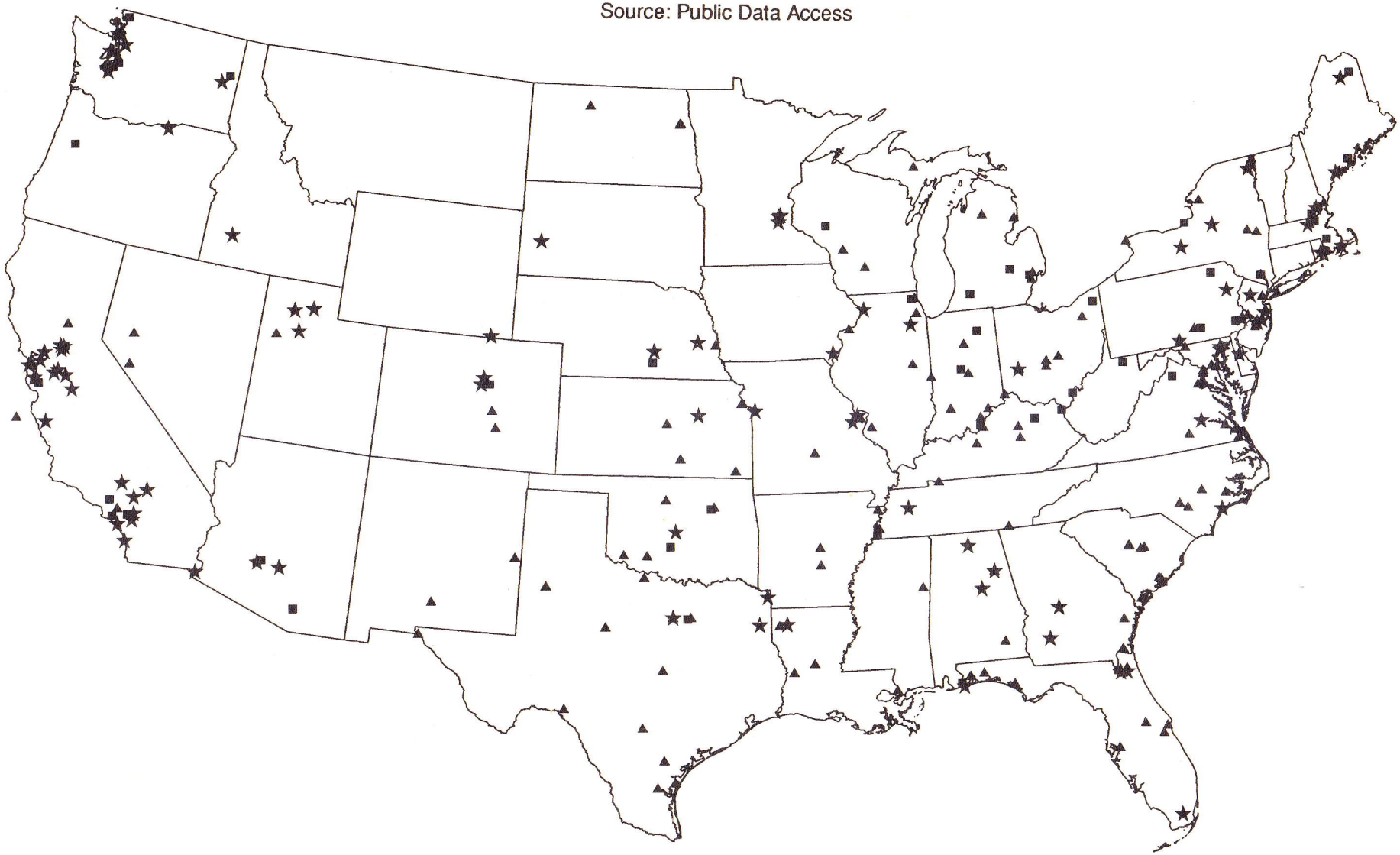
[56]"Department of Defense Seeks Alternatives for Ozone-Depleting Chemicals," Press Release No. 541-88, Office of Assistant Secretary of Defense (Public Affairs), November 2, 1988; William H. Parker, III [Deputy Assistant Secretary of Defense (Environment)], "CFC's and Halon Use Reduction within the Department of Defense," paper presented to the U. N. Environmental Programme seminar on "Substitutes and Alternatives to Chlorofluorocarbons (CFC's) and Halons," October 20, 1988. Florida data, from the Toxic Release Inventory, is analyzed in "Florida Weapons Contractors Deplete Ozone Layer, Military Gives 'Sunshine State' Motto Ironic Twist," press release, Florida International University College of Business Administration, Department of Marketing and Environment, Nov. 8, 1990.

[57]J. Winston Porter, "Enforcement Actions Under RCRA and CERCLA at Federal Facilities," Memorandum, EPA Assis. Admin., Office of Solid Waste &Emergency Response, January 25, 1988, p. 1.

FIGURE 3

MILITARY NATIONAL PRIORITY LIST SITES AND ENVIRONMENTAL PERMIT VIOLATORS

Source: Public Data Access



★ MILITARY SUPERFUND SITES

■ MILITARY FORMERLY USED SUPERFUND SITES

▲ MILITARY ENVIRONMENTAL PERMIT VIOLATORS

have challenged the authority of EPA and the state to enforce those laws. The Attorneys General of all 50 states, as well as interested members of Congress, assert that states can order the Pentagon, Energy Department, and other Federal agencies to take corrective actions to clean up sites under RCRA. But the Justice Department contends that Federal agencies are exempt from state enforcement under the doctrine of "sovereign immunity." The courts have not yet cleared up this issue. However, the State of Maine has won the first stage in a court battle to force the Portsmouth Naval Shipyard to pay penalties and to comply with Maine's hazardous waste enforcement program.

The Portsmouth Naval Shipyard's compliance history is a pitiful testament to DOD arrogance:

> Portsmouth has generally refused to pay its annual and generator fees. Inspections have shown more numerous and serious violations than those at [Bath Iron Works, the state's privately owned shipyard]. Even the simplest violations seem to take years to resolve and many violations, such as failure to keep lids on drums of hazardous waste and failure to properly label them, have been found in virtually every inspection since the first major inspection in 1981.... Portsmouth has never entered into any settlement with the Department of Environmental Protection and never paid penalties.[58]

Unwilling to wait for the courts to fully resolve the issue, Maine and the other states and territories want Congress to clarify that sovereign immunity does not apply to RCRA enforcement. Other environmental legislation, including the Clean Air Act, explicitly waives sovereign immunity in its enforcement provisions.

In addition, EPA officials are aware that they need the power to sue other Federal agencies for action under RCRA.[59] But the Justice Department—which serves as the EPA's "law firm" in all litigation matters—has refused to bring enforcement suits against DOD, claiming that the "unitary theory of the executive" precludes one agency of the executive branch (EPA) from suing another agency (DOD).

The Governors and state Attorneys General from both parties have been working for several years to win legislation which would override both sovereign immunity and the unitary executive theory. In 1989, the House overwhelmingly passed HR 1056, which would have given EPA and the states clear authority to enforce hazardous waste laws, but the Senate version, the Federal Facilities Compliance Act

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[58]Maine Attorney General James Tierney, *Cleanup at Federal Facilities,* Hearings, Subcommittee on Transportation, Tourism, and Hazardous Materials, House Committee on Energy and Commerce, March 3, 1988, p. 69.

[59]For example, Jonathan Cannon, Acting Assistant Administrator, EPA Office of Solid Waste and Emergency Response, testified before a House Subcommittee on April 12, 1989, "The position which my office has taken in internal discussions within the agency and with other Federal agencies is that H.R. 1056 would offer useful provisions to improve or to encourage environmental compliance on the part of the Federal facilities under RCRA. *Environmental Compliance by Federal Agencies,* p. 130.

(S. 1140), never came to a vote. DOD opposed this legislation because, its spokesmen argued, it would, in effect, give outsiders control of the limited DOD environmental budget. Proponents are expected to reintroduce the legislation early in 1991.

No One is Home at EPA to Require Compliance at DOD

Even where environmental laws are strong, they have little impact without experienced, expert oversight. EPA, however, is suffering from severe understaffing. In 1985, EPA's resource models said that the agency needed 57 senior positions to enforce multi-media compliance at Federal facilities. However, as of 1989 only 12 such positions were filled at EPA headquarters while 14 were filled at regional offices. Lee Herwig, former director of the Office of Federal Facility Compliance, said that staffing should be five to ten times higher to achieve minimal oversight.[60]

In 1990, 11 of the 12 headquarters regulators, including Herwig, quit after EPA consolidated his office with another group. Even before the departures, EPA couldn't keep up with its workload. Now, it will take a long time before the agency has the personnel needed to initiate inspections sufficient for widespread Federal facility enforcement.

Recommendations

1. Every military installation, including non-manufacturing facilities and vehicles operated by those installations, should be required to file detailed toxic release information through EPA's Toxic Release Inventory (TRI) under the Federal Emergency Planning and Community Right to Know Act of 1986.

2. Congress should create a consolidated **Defense Environmental Security Budget** that clearly describes all Pentagon programs for environmental restoration, environmental protection, pollution prevention, and environmental research and development. While individual programs may be funded directly through the armed services, a central Pentagon environmental office should compile and assess this information in a public report each year.

3. DOD should consolidate its waste generation and disposal information in the same environmental office. Working with the EPA's Office of Federal Facility Enforcement, such an office should implement, throughout the Pentagon, data entry quality standards and checks, standard methods and units for measuring hazardous wastes, and standard geographic identification codes. The office should not only

[60]Benjamin Goldman telephone interview with Lee Herwig, June 11, 1990.

publish summary data, but it should make its records accessible in a timely, affordable fashion to public interest groups and the media.

4. Responsibility for the storage and disposal of hazardous waste should be moved from DRMS to a Pentagon office where environmental responsibilities are primary.

5. NTCF supports immediate enactment of the Federal Facilities Compliance Act, which affirms the rights of EPA and the states to enforce RCRA at Federal facilities.

Chapter 3

Military Waste Management: Shell Game or Pollution Prevention?

Even the promise of eventual compliance with the law at landfills and incinerators is no great relief to the people who live around military toxic waste facilities. For instance, the operation of hazardous waste landfills, whether undertaken by the government or private contractors, is fraught with the likelihood of eventual leakage. As William Ruckelshaus, chief executive officer of Browning Ferris Industries and former Administrator of the EPA has stated:

> Of course all landfills will leak. Our instincts tell us that, whether it is 10 years, 100 years or 1000 years....every landfill will leak in the sense that some liquids will come down through in periods of high rainfall or other occasions.[61]

DOD hopes to eliminate the land disposal of "untreated" hazardous wastes by 1992. Treatment, however, does not truly eliminate the toxics in the waste stream. Instead, it changes the *form* in which some of the toxics are managed. For instance, instead of managing the toxics in liquid form, they may be converted to a solid or sludge form, which makes spillage less likely during transport to a dumpsite. Nevertheless, the chemicals continue to pose a long-term threat to the environment and public health.

Waste burning and incineration jeopardize health and the environment by releasing unburned waste byproducts into the atmosphere. When burned, hazardous wastes can break down into various toxic constituents such as benzene, or recombine to form deadly compounds such as dioxins. The following are examples of the toxic constituents emitted by incinerators:

- **Dioxins**—Dioxins include some of the most toxic chemicals ever studied. They accumulate in living tissue, and they have been reported to cause skin rashes, immune system disorders, liver disease, kidney cancer, birth defects, and death. Dioxin is highly lethal—some forms are 10,000 times more deadly than cyanide.[62]

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[61] William Ruckelshaus, before hearing of California Water Resources Control Board, Division of Water Quality, Sacramento, October 3, 1989.

[62] Calvin R. Brunner, *Hazardous Air Emissions from Incinerators,* 1985, p. 57. Many of the following hazards of incineration are also described in this source. In particular, see pp. 11-14, 45, and 50.

- **Furans**—Also known as "polychlorinated dibenzofurans," or PCDF's, these compounds have chemical features in common with dioxins. Studies have concluded that they can be just as deadly as dioxins.

- **Metals**—Many dangerous metals are released by incinerators, including antimony, cadmium, chromium, copper, lead, mercury, nickel, and zinc. Metals are not destroyed by the process of incineration; they are simply redistributed between the air emissions and the ash residue produced by the incinerator. The "heavy metals," such as arsenic, cadmium, lead, and mercury, are toxic at very low levels and can accumulate in living organisms over time. The specific effects associated with each metal vary: arsenic causes skin cancer; cadmium can cause heart disease, kidney failure, and genetic damage; chromium can cause weight loss, skin conditions, and cancer; and lead and mercury damage the nervous system, sometimes fatally. Nickel forms a carcinogenic compound, nickel carbonyl, in incinerator smoke.

- **Ash and Particulates**—Incinerator stacks emit fine particulates, sometimes called fly ash or soot, composed of relatively non-burnable portions of the waste stream. Although scrubbers—pollution control equipment—remove some particulates, they do not catch smallest particles, the most hazardous particulate emissions. The smallest airborne particles (under 3 microns) are the greatest threat to public health because they can enter the deepest and most sensitive parts of the lungs. Unfortunately, the vast majority of the metals emitted from incinerators are in the form of tiny particles. Small particles are also high in toxic organic compounds such as dioxins and furans.

- **Acidic Gases**—Oxides of sulfur in incinerator emissions can cause respiratory distress, headaches, and nausea, and they are possible carcinogens. Sulfur oxides can harm plants. For example, in concentrations as low as 0.5 parts per million, they damage fruit trees . They can form sulfuric acid, which eats away at building materials, particularly stone and marble. Sulfuric acid, as well as large volumes of nitric acid and hydrochloric acid also produced by incinerators, contributes to acid rain, jeopardizing both aquatic and terrestrial organisms.

- Other Organic Compounds and Unknown Emissions—Incinerator emissions typically contain a variety of uncombusted compounds from the incoming hazardous waste. The range is as broad as the variety of wastes burned: over one hundred of these residues have been identified in tests conducted by the EPA. Additional compounds are also present in stack emissions but not characterized by EPA. In fact, 44 percent (by weight) of the unburned hydrocarbon emissions of a typical incinerator have not even been characterized![63]

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[63]American Society of Mechanical Engineers, *Hazardous Waste Incineration,* 1988, p. 77.

Case Study: Vertac Chemical, Jacksonville, Arkansas

Jacksonville, Arkansas, is a town of about 30,000 people and the site of the Little Rock Air Force Base. At a factory there, Hercules Inc. manufactured, in 1967 and 1968, about one quarter of the Agent Orange herbicide sprayed by U.S. forces in Vietnam. Hercules and its successor, Vertac Chemical, continued to manufacture herbicides at the site until 1986.[1] The operation polluted Jacksonville's backyards, creeks, schoolgrounds, and drinking water with toxics wastes including dioxins, and it left behind a deposit of 28,500 barrels of chemical waste, including dioxin-contaminated sludge, dirt, and sediment. For this reason, many local residents call the town "Dioxinville."

Dioxins are a group of chemicals that include some of the most toxic substances ever manufactured. At Love Canal (New York) and Times Beach (Missouri), two of the nation's best known toxic horror stories, communities were uprooted because of the presence of dioxins.

The Hercules-Vertac plant sits near the top of the Superfund National Priorities List. Since Vertac Chemical shut the plant and transferred its assets, the Environmental Protection Agency has taken direct responsibility for the site. In addition, two Jacksonville landfills are also on the NPL because the herbicide-makers dumped some of their wastes there. Though Jacksonville residents and military dependents cannot get the Air Force to release any details, Little Rock Air Force Base, a former shipping point for Agent Orange, reports 23 toxic hot spots of its own.

Dioxin has taken a toll on the community. The childhood cancer rate is more than seven times the national average. Within a four block area, says *Family Circle* magazine, one neighbor reported that out of 52 people, 26 died of brain tumors, breast cancer, and lung cancer since 1970. A door-to-door survey found 10 out of 18 children had serious health problems, from seizures to spina bifida.[2] Incredibly, town leaders deny that dioxins threaten their community. When *Family Circle* first mentioned Jacksonville's toxic problems, the City Council censured the magazine while a local newspaper suggested that the magazine's staff "stay in the kitchen."

However, the residents of Jacksonville are not staying in the kitchen, the garage, or the living room. Last June, for example, three hundred residents staged a protest meeting to demand that the EPA not carry out its plan to incinerate, on site, 28,500 barrels of herbicide wastes. At least 3,000 barrels contain high concentrations of dioxin. Despite continuing protests, the EPA started "test" burns last fall.

Opponents of the burn are concerned that the kiln's smokestacks will release dioxins near two residential areas and a hospital, multiplying the town's already substantial toxic toll. One resident offered an analogy, "It's called unloading the gun by pulling the trigger."[3]

Many of Dioxinville's victims and most active protesters are military personnel and their dependents, but the Air Force has attempted to stifle concern in its ranks, transferring active-duty spouses of environmental activists to other regions. Perhaps the military (and Veterans' Administration), facing the Agent Orange-related claims of more than 259,000 Vietnam Veterans, is reluctant to take full responsibility for its deadly legacy.

Patty Frase, daughter of a former base commander at Little Rock Air Force Base, vowed to take on Dioxinville after both her parents died as a result of an explosion at Vertac. She says the Air Force should warn incoming military families that Jacksonville is a dangerous town, but it won't. Once, when she took her case to Washington, an aide to Senator Edward Kennedy told her, "If they announced there were problems, the military would have to pay those men hazard pay for just being there."

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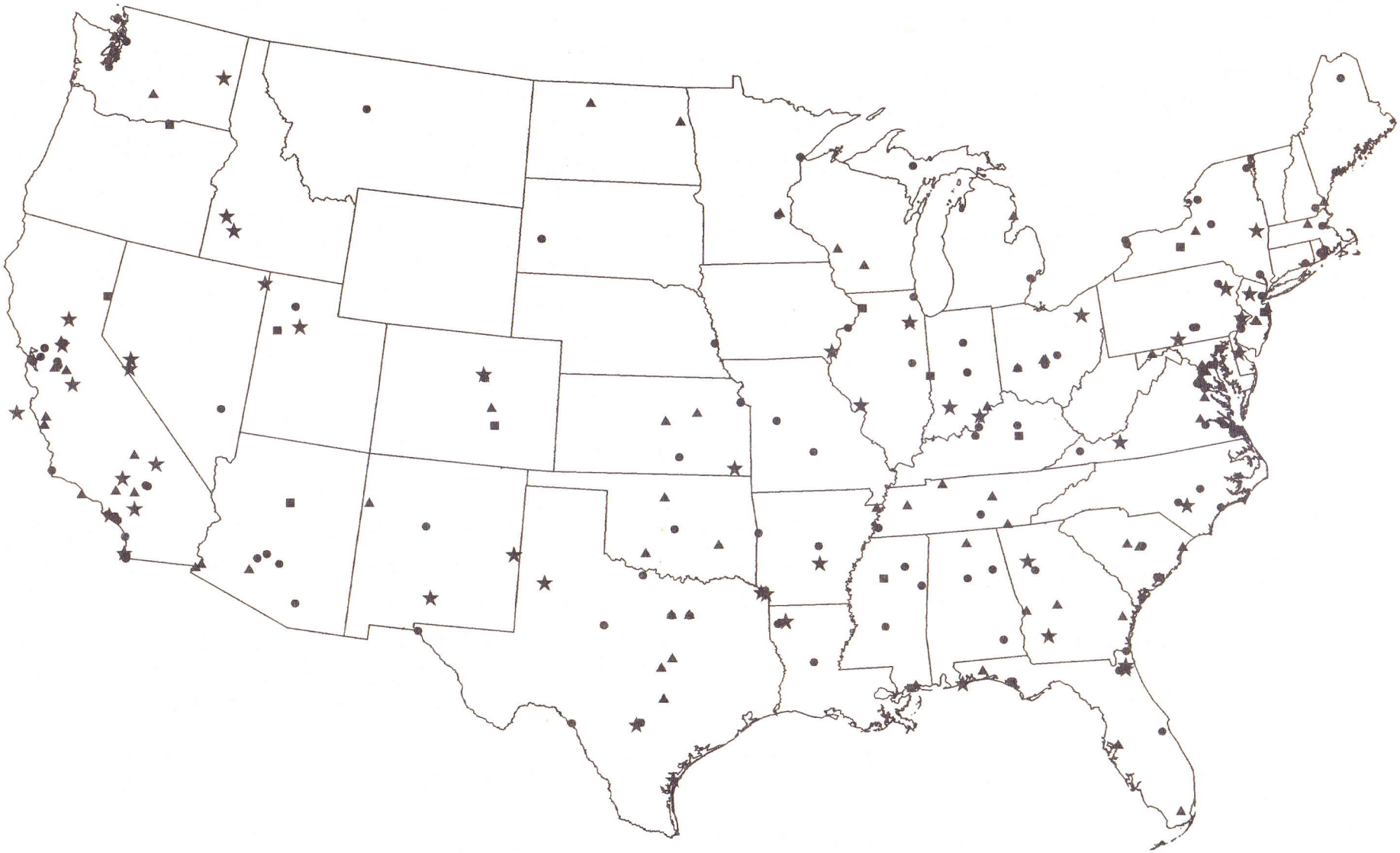
[1] Dick Russell, "Welcome to Dioxinville, Arkansas," *In These Times,* March 9-15, 1988.

[2] Stephanie Abarbanel, "Toxic Nightmare on Main Street," *Family Circle,* August 14, 1990.

[3] Cary Bradburn, "Protesters Turn Vocal over Vertac." *Arkansas Gazette,* July 18, 1990, p. 4B.

FIGURE 4

MILITARY HAZARDOUS WASTE MANAGEMENT FACILITIES



★ MILITARY LAND DISPOSAL FACILITIES

▪ MILITARY INCINERATORS

A Better Solution: Toxics Use Reduction

Along with much of American industry, some military officials are experimenting with "toxics use reduction," replacing hazardous materials with safer materials and employing alternative methods that reduce the usage of toxics.[64] This is true "pollution prevention," the best way to reduce the generation of hazardous wastes and other toxic pollutants. It is the only approach that can truly ensure lowered waste generation and the reduced exposure of workers, the public, and the environment to toxics.

In the last five years, three nationwide policy initiatives were taken to prod DOD officials to take pollution prevention seriously.

First, in the mid-1980's, the Pentagon ordered each of the armed services to reduce its generation of hazardous wastes by half by 1992, compared to their waste generation in 1984. In addition to base-by-base pollution prevention projects, the Defense Environmental Restoration Account and the armed services are funding widely applicable research projects to aid in reducing the use of hazardous materials under this same initiative.

Secondly, Congress has required military industrial facilities—that is, "each industrial-type activity within the [Defense] department... for which a working-capital fund has been established"—to set aside at least one half of one percent of their working capital funds to finance new waste minimization projects.[65]

Finally, in July 1989, the DOD adopted a directive for "hazardous material pollution prevention," setting forth some potentially far reaching policies on hazardous materials selection, use and management. For a wide range of "functional areas" within the military, a preference is established to "avoid or reduce the use of hazardous materials... in processes and products as distinguished from end of pipe management of hazardous waste." It sets forth coordination and reporting requirements which would support this policy and lead to the preparation of hazardous material pollution prevention plans for each branch of the military. The directive should

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[64]Toxics reduction methods can and should be "multi-media." That is, the reduction measures that we advocate apply equally to preventing toxic pollution of the air, through smokestacks or "fugitive" emissions; of the water through discharge pipes or leaks; and of the land by dumping or "disposal." Reducing pollution at one site or discharge point should not increase the discharge of toxics to the environment from elsewhere within the production system or economy. For a more lengthy discussion of the hazards of waste disposal and the superiority of toxics use reduction policies, see the National Toxics Campaign Fund report, *From Poison to Prevention,* August, 1989.

[65]"Department of Defense Authorization for FY1990," Conference Report, p. 77.

lead to the preparation of supporting documents on budgeting, research and development, repairs, and weapons system maintenance.[66]

As a result of these policies, dozens of bases are experimenting with new industrial and maintenance processes. For example:

- Facilities in all three armed services are now stripping paint by blasting soft plastic beads at painted components, instead of using toxic solvents. For example, the Naval Undersea Warfare Engineering Station in Keyport, Washington, has replaced chemical strippers with two plastic-media-blasting booths to remove paint from aluminum torpedo parts. The Navy says that the new process cuts waste by 90 percent, or 160,000 gallons per year, saves about $200,000 per year in disposal costs, and shortens the time to strip a torpedo from 4 hours to 15 minutes.

- At Fort Ord, (Monterey, California), the Army now uses high-pressure spray washers to degrease and clean automotive parts:

  > The use of these washers eliminated the need for dip tanks filled with trichloroethane [methyl chloroform]. The total cost of these units was $24,900. The savings from the elimination of the use of trichloroethane will provide a payback in approximately two years. Over and above the economic benefit, this change also decreases the potential detrimental health effects to workers using trichloroethane and eases working conditions by eliminating the need for cumbersome protective clothing.[67]

- The Air Force Logistics Center at McClellan Air Force Base (Sacramento, California) is using ion vapor deposition to coat specific aircraft parts with aluminum, instead of cadmium, eliminating cyanide from the process and reducing the generation of hazardous waste.

- Some army depots distill plating shop waste streams, allowing the in-process reuse of both waste metal and rinsewater. The Army's Milan (Tennessee) ammunition plant is utilizing a dry vacuum to recover residual explosives from processing areas.

Toxics Reduction vs. Dangerous "Waste Minimization"

"Waste reduction" or "toxics use reduction" measures, as supported by the National Toxic Campaign Fund and other environmental organizations, avoid the

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[66]DOD Directive No. 4210.15, July 27, 1989.
[67]*DERP Annual Report for FY 1989*, p. 19.

transfer of hazardous wastes from one site to another. Instead, new in-house practices yield reduced toxics wastes. They include:

1. Substituting non-toxic or less toxic substances for highly toxic chemicals used in production processes.

2. Changing the design or composition of an end-product, or even kind of end-product produced, so that operations use less toxics.

3. Modifying or modernizing the production line, replacing or changing production equipment and technologies.

4. Better Housekeeping: Targeting and plugging up small toxic "leaks" through improved monitoring, cleanup, and operational procedures.

5. Recovering and reusing valuable, but hazardous materials by creating "closed loop" processes.

Unfortunately, some of the practices employed by the military under the guise of "waste minimization" are not consistent with this approach. Instead, they include activities which are themselves known to cause toxic pollution of water or air resources.

The Pentagon's directive to reduce the use of hazardous materials encourages, among other things, "consumptive use, [and]... regenerating spent material." Thus, this policy actually promotes off-site recycling and the burning of waste-bearing solvents as fuel.[68] While these approaches save cash, off-site recycling creates hazards to health and the environment during the transportation and storage of the wastes. Approximately ten percent of U.S. Superfund sites originated as hazardous waste recycling facilities.

The current structure of the DOD's waste reduction funding mandate itself encourages unsound practices at operational bases. The Congressional directive requiring installations to spend one half percent of capital funds on "waste minimization" applies to "military-industrial" facilities only, and not to other bases. Under current policy non-industrial installations must use funds from budgets serving a wide variety of needs, so it often makes short-term economic sense for base commanders to ship wastes off site for recycling and incineration, rather than invest in toxics use reduction.

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[68]There is no doubt that these strategies are being employed. In the early 1980's, for example, the DOD Inspector General's office highlighted, as a model for other bases, three installations that saved a total of 67,000 gallons and $80,000 by "recycling" solvents as fuel oil. See "Hazardous Waste: DOD's Efforts to Improve Management of Generation, Storage, and Disposal," GAO, p. 59.

Case Study: The Coast Guard Isn't Clear

The U.S. Coast Guard is not part of the Department of Defense, but its problems with hazardous waste are similar to those of the U.S. Navy. Perhaps because its operations are smaller, the Coast Guard has escaped widespread scrutiny of its environmental impact.

The Coast Guard has identified 61 of its facilities as possible sites for surface or underground toxic contamination. Of those 61 locations, 26 required cleanup, 24 were determined to be clean, and 11 await assessment. Twelve of the 26 polluted facilities have already been cleaned up, while 14 others require decontamination. In addition, the Coast Guard has accepted responsibility for contributing to hazardous waste contamination at 11 private Superfund sites and one state cleanup site.[1]

Of the 14 cleanup locations, four require extensive, expensive remediation. Work is already underway at the Brooklyn Air Station, where cleanup is expected to continue until the year 2000. Already the Coast Guard has spent $500,000 on that effort.

Investigation of contamination at Elizabeth City, North Carolina, is progressing slowly. Groundwater beneath the Coast Guard Support Center there was contaminated by leaks from a hazardous waste lagoon and a fuel tank farm. The Coast Guard has spent nearly nearly $6 million at Elizabeth City thus far, but total cleanup costs over the next 25 years could reach $30 million, according to official estimates.

In Alaska, the Coast Guard has identified 19 possible hot spots at the Kodiak Support Center, including six sites where solvents and fuels have already leaked into the ground. The Coast Guard is disputing financial responsibility for a portion of the cleanup with the Kodiak Electric Association, to which it sold electrical equipment—cables and transformers—contaminated with polychlorinated biphenyls (PCBs). The Coast Guard insists that Kodiak Electric is responsible for cleaning up the equipment, a task that could cost above $5 million, because it sold it "as is, where is." Total cleanup costs at Kodiak are expected to be as high as $50 million over the next 30 years.

The Coast Guard Air Station in Traverse City, Michigan, has groundwater contamination from a 1969 fuel spill and leaking fuel tanks. Local residents who use that water sued the Coast Guard, which then agreed to pay for connecting those homes to city water supplies. Cleanup started in 1984, and the Coast Guard hopes to finish in 2005. It has already spent $7 million out of an anticipated $20 million.

The Coast Guard operates hundreds of facilities, 172 of which handle hazardous waste. Of those, less than a quarter handle more than 2,200 pounds per month. Two installations, Kodiak and Elizabeth City, operate treatment, storage, and disposal facilities.

Inspectors from the Environmental Protection Agency and its state counterparts inspected 37 Coast Guard facilities in 1986-1988. Nearly half (17) were cited for 129 violations of the Resource Conservation and Recovery Act (RCRA), the major Federal legislation governing the handling and disposal of hazardous wastes. By August 1989, the Agency had corrected 100 violations. Most (24) of the remaining violations are at Elizabeth City and Kodiak.

To get the Coast Guard to comply with RCRA at Elizabeth City (as well as a less polluted Coast Guard base in Miami Beach, Florida) EPA presented a Federal Facilities Compliance Agreement (FFCA) in late 1989, but the Coast Guard refused to sign. In March, 1990, EPA's regional office referred the Elizabeth City situation to to EPA headquarters. It explained:

> The [Coast Guard] has refused to sign the documents, for the most part, because of fundamental disagreements with the standard language contained in the FFCA and because they did not believe the agency could enforce its provisions. The provisions are essentially the same as those contained in agreements that have been signed by other federal agencies (DOD, DOE, and NASA).[2]

[1] Most of the information in this section comes from Victor S. Rezendes, "The Coast Guard's Cleanup of Hazardous Waste Sites," Statement for the record before the Subcommittee on Coast Guard and Navigation, House Merchant Marine and Fisheries, General Accounting Office (GAO/T-RCED-90-6), November 1, 1989.

[2] "Enforcement Action Against U.S. Coast Guard-Elizabeth City, NC Referred to U.S. EPA Headquarters for Resolution," Press Release, EPA Region IV, March 7, 1990.

Timely Use

One way to reduce waste generation is to avoid allowing materials and products to age to the point where they become wastes. Timely use of materials can reduce accidental releases and can reduce waste and pollution. A surprisingly large portion of DOD's hazardous waste consists of unused hazardous materials—batteries, paints, oils, and other chemicals. The General Accounting Office conducted a random sample covering about a half million dollars worth of disposed military products, and it found that at least 40 percent were unused. Of that 40 percent, 80 percent (32 percent of the total disposed) had exceeded their shelf life.

GAO recommended, therefore, that hazardous materials having short shelf lives be delivered from manufacturers directly to the bases that need them. It also recommended stricter application of policies calling for "first-in first-out" inventory practices. It also suggested that materials be tested before they are discarded as waste.[69]

None of these recommendations is controversial. Yet, after ten years of active Pentagon hazardous waste management, the problems persist.

How Much Pollution Prevention is the DOD Really Achieving?

Despite a few important model changes in written military policy and examples of several helpful on-site process changes, the General Accounting Office has been unable to identify sweeping progress on waste reduction within the DOD. It is virtually impossible to determine how much reduction has been achieved because, as described in the previous chapter, the military has no reliable, consistent mechanism for measuring waste generation. Nor is there as yet any evidence of a systematic reorientation of DOD toward pollution prevention as the principal method of protecting the environment. Installing pollution control equipment, rather than changing production and operational practices, apparently remains the leading approach to environmental compliance.

Even after the armed services finally improve their reporting on waste generation, it will be difficult to determine to what degree changes in toxic output reflect improved processes and procedures, and to what degree they are the result of variations in military activity or overall production output. The real question is the waste

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[69]"Hazardous Waste: Attention to DOD Inventories of Hazardous Materials Needed," GAO/NSIAD-90-11, November, 1989.

generated per unit of activity, not just the amount of waste generated at a given location. Beale Air Force Base (Marysville, California), for example, probably has no more problems with liquid wastes from its photo lab, but that's not because it figured out a better way to develop pictures. Rather, the Air Force hasn't had many pictures to develop there since it took its SR-71 "Blackbird" strategic reconnaissance aircraft out of service last year.[70]

This issue goes beyond record-keeping. The military must clarify its waste minimization goal to promote toxics use reduction, not just to decrease waste volumes on the bases. If this is not done, bases may contract out "dirty work," merely shifting the toxics to someone else's site. Commands may take credit for lowered levels of waste generation resulting from base closings or other forms of demobilization. Cutting back unnecessary military activity is a step in the right direction, but it should not be a loophole through which continuing operations can avoid real waste reduction measures.

To Build or Not to Build

We don't expect the military to stop building weapons merely because warfare devastates environments and public health. But DOD should think twice about developing particular weapons when advance environmental assessment suggests that design, production, testing, fielding, or maintaining the weapon will have unavoidably severe consequences for domestic, allied or global environments.

There are precedents for allowing environmental concerns to rule out such systems. Several basing modes for the M-X Inter-Continental Ballistic Missile were rejected because of the environmental consequences. The U.S. supersonic transport (SST), a civilian project similar to military work, was junked in part because of its likely impact on the atmosphere.

Now DOD, Congress, and the President are considering a "brilliant pebbles" system of space-based strategic defense, which would require hundreds or even thousands of rocket launches. First rockets would be launched to test the technology, then to deploy the "pebbles" in space. As described in the National Toxic Campaign

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[70]GAO reports, ("Hazardous Waste: DOD Efforts to Reduce Waste," p. 28):

> The lack of correlation between hazardous waste generation data and production levels can hinder the services' ability to distinguish between changes in production levels and the effects of minimization efforts. For example, Morton Thiokol operates a government-owned production facility at the Army's Redstone Arsenal, Alabama, and generates 98 percent of the arsenal's hazardous waste. According to Redstone's Hazardous Waste Minimization Plan, the arsenal's hazardous waste generation increased from 189,243 kilograms in 1985 to 487,820 kilograms in 1987. Waste generation increased, partly because Morton Thiokol's production of weapons materials increased 83 percent since 1985.

Fund's report, "No Free Launch," high volume rocket-launching creates toxic pollution at the production, testing, and launch sites. The environmental threat from our own "Star Wars" system may exceed the military threat that it is intended to counter.

Recommendations

1. The military's pollution prevention program needs new focus and emphasis, and more funding. We recommend the creation of Pollution Prevention Offices at the Defense Department, the three armed services, and the Defense Logistics Agency. These offices would promote and coordinate pollution prevention activities, disseminate information regarding results achieved, and monitor the environmental impact of existing production and maintenance efforts.

2. Congress should conduct or sponsor a comprehensive review of the environmental impact of America's space programs—military, joint military-civil (NASA), and commercial. Some of the environmental risks can be minimized by promoting more environmentally sound propulsion technologies; however, it may also be prudent to give up on Star Wars to protect the planet.

3. All commands and bases should be required to set aside at least one percent of all funding for industrial and maintenance activity to develop and implement technologies for reducing the use of hazardous materials.

Chapter 4

Private Contractors and Military Purchasing Power

Military contractors make up a large and influential fraction of the U.S. industrial economy. The largest military contractors include well-known aerospace corporations, such as Lockheed, McDonnell Douglas, and General Dynamics; major manufacturers such as General Motors, General Electric, and IBM; and oil companies such as Chevron, Exxon, and Shell Oil.

Many defense contractors are listed as Potentially Responsible Parties (PRP) for hazardous waste sites on the National Priority List (NPL), which means, under the Superfund Law, that they will be billed for cleanup. Some of the nation's largest military contractors pose a serious threat to environmental security. For example, the top 10 military contractors are listed 133 times by the Environmental Protection Agency as PRPs at the nation's 100 largest NPL sites.[71]

Military contractors are major polluters, responsible for hundreds of toxic wastes sites nationwide, as well as millions of pounds of dangerous chemical emissions annually. These contractors enjoy a privileged status: they can pollute the environment and neighborhoods where they operate, while the taxpayers pick up the bill for their offenses.

Taxpayers Bail Out Private Contractors

Though governed by the same environmental laws that regulate other private industries, military contractors present unique problems by virtue of their cozy relationships with the Federal government. Many military-oriented companies behave as environmental outlaws, and then they expect the Pentagon to bail them out once their reckless environmental practices come to light.

Cleanup deals that the Boeing Corporation struck with the Air Force illustrate this point. Boeing dumped 24 million gallons of toxic waste into two Seattle-area landfills over the course of thirty years. Both sites are now on the Superfund NPL. Boeing, as the largest dumper, has accepted responsibility for cleanup costs. However, the company has also gotten the Air Force to agree to reimburse cleanup costs of up to $27 million if the company's insurers fail to cover this liability. Thus, a

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[71]Bill Richards, "Pollution Loophole Soaks U.S.," *Seattle Post-Intelligencer,* May 8, 1990, p. 1. The *Post-Intelligencer* data, presented in the chart below, probably includes wastes generated by non-military production at these firms.

lawsuit filed by Boeing against its insurers will determine whether US taxpayers or Boeing's insurers will pay $27 million (out of total cleanup costs as high as $80 million).

TABLE 4

Top DOD Contractors Listed as Superfund NPL Potentially Responsible Parties

Contractor	Listed Superfund Sites
General Electric	47
General Motors	32
Raytheon	12
McDonnell Douglas	9
Lockheed	9
Grumman	7
General Dynamics	6
Boeing	4
Martin Marietta	4
United Technologies	3

Source: *Seattle Post-Intelligencer*

The Air Force, which has already paid nearly $13 million, says that cleanup is a normal cost of doing business. However, Boeing's insurers contend that Boeing was warned about pollution problems at the landfills, but continued to dump there anyway.

> ... [I]nsurance company attorneys said Boeing received 16 warnings since 1952 that the company's hazardous-waste dumping at the two sites would lead to pollution and lawsuits. The warnings, disclosed in a lawsuit between Boeing and its insurers, came from state officials, consultants, and from Boeing employees.[72]

The Pentagon has reportedly agreed to reimburse Boeing's cleanup teams at several other sites nationwide, including a plant in Wichita, Kansas with extensive TCE groundwater pollution.

Other firms, such as Aerojet-General (see case study) and Lockheed, are also billing the U.S. taxpayers to cleanup the companies' messes. Lockheed expects the Pentagon to reimburse it for cleanup at its company-owned plants at Harbor Island

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[72]Bill Richards, "Air Force Unaware of Boeing Pollution Warnings," *Seattle Post-Intelligencer,* April 19, 1990, p. A11.

(Seattle), Burbank (California), and Sunnyvale (California), as well as the Operating Industries landfill in Monterey Park, California, where Lockheed is a PRP.[73]

GOCOs: Subsidizing Toxics Poisoning

Government-Owned Contractor-Operated (GOCO) facilities are among the Pentagon's biggest toxic headaches. Sixty of DOD's sixty-six GOCOs show up on the Defense Environmental Restoration Program (DERP) list of cleanup sites. Twelve GOCOs, plus the Rocky Mountain Arsenal, are on the NPL.

Because they work so closely with the DOD, the private GOCO contractors often escape accountability for their environmental mistakes.

TABLE 5

GOCOs on the Superfund National Priorities List

Company	Site	Location
Day & Zimmerman	Lone Star Army Ammunition Plant	Texarkana, Texas
FMC Northern Ordnance	NIROP-Fridley	Fridley, Minnesota
General Dynamics	Air Force Plant 4	Ft. Worth, Texas
Honeywell	Twin Cities Army Ammunition Plant	New Brighton, Minnesota
Hughes Aircraft (GM)	Air Force Plant 44	Tucson, Arizona
NI Industries (Norris)	Riverbank Army Ammunition Plant	Riverbank, California
Mason & Hanger (Silas Mason)	Cornhusker Army Ammunition Plant	Grand Island, Nebraska
Mason & Hanger (Silas Mason)	Iowa Army Ammunition Plant	Middletown, Iowa
Martin-Marietta	Milan Army Ammunition Plant	Milan, Tennessee
Morton Thiokol	Louisiana Army Ammunition Plant	Shreveport, Louisiana
Remington Arms	Lake City Army Ammunition Plant	Independence, Missouri
inactive	Hunters Point Naval Shipyard	San Francisco, California

Source: Department of Defense

The GOCO relationship dates from World War II, when the military and the Manhattan (A-bomb) Project hired contractors to operate military industrial facilities. DOD has sold off at least 21 GOCOs over the last 11 years. Today, however, efforts to divest additional facilities are being hampered by widespread environmental contamination at those locations.

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[73]Bill Richards, "Feds Billed for Shipyard Cleanup," *Seattle Post-Intelligencer,* June 1, 1990, p. C1.

The Air Force owns 13 GOCOs, known as Air Force Plants (AFPs), and the Navy owns 18, known as either Naval Industrial Reserve Ordnance Plants (NIROPs) or Naval Weapons Industrial Reserve Plants (NWIRPs).[74] Contractors use these plants to build weapons for the contracting branch of the armed services. For example, Hughes produces tactical missiles at Air Force Plant 44 in Tucson, Arizona, and Lockheed builds sea-launched ballistic missiles at the Sunnyvale, California NIROP.

In general, Army GOCOs produce specific products. Most of the Army's 34 GOCOs are Army Ammunition Plants. The Rocky Mountain Arsenal, one of the Army's most polluted installations, is not listed as a GOCO, but the Army leased a portion of the Arsenal to Shell Oil for pesticide production from the early 1950's to the early 1980's.

Some GOCO operators may have been unaware of their environmental problems. Others may have believed they would not be caught. However, many failed to behave with caution simply because they knew that DOD would bail them out. As Deputy Assistant Defense Secretary Parker has testified:

> The Department funds most cleanup costs for sites created by past practices at GOCOs. In effect, the responsible contracting officers in the DOD components [the armed services and DLA] have determined that the operating contractors were using facilities provided by the government in ways commonly accepted as reasonable business practices at the time the contamination occurred. We have invested about $182.2 million (Air Force = $80.5 million; Army = $96.7 million; Navy = $5.0 million) from the Defense Environmental Restoration Account through FY 88 at our GOCOs. Most of these funds were used to find and fix contamination at these facilities. If we subsequently determine, however, that the contamination was caused by illegal activities or grossly negligent contractor operations, we will seek reimbursement.[75]

In contrast, as Congressman Mike Synar (D-Oklahoma) has pointed out to DOD officials, owners and operators of civilian Superfund sites are not excused from financial responsibility because they used methods that were "acceptable at the time of disposal."[76]

At most sites, GOCO contractors are not helping pay for toxic cleanup. Only rarely have GOCOs agreed to pay a share of their environmental offenses. For example, Shell Oil agreed to pay a fraction of the Rocky Mountain Arsenal cleanup

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[74]Air Force Plant 42, in Palmdale, California, actually has sections run by five different contractors. The 66th GOCO is the Defense Logistics Agency's William Langer Jewel Bearing Plant, operated by Bulova, in North Dakota. "Government-Owned Contractor-Operated (GOCO) Plants," Department of Defense, 1989.
[75]*Overview of DOD Environmental Activities,* pp. 265-266.
[76]*Hazardous Waste Problems at Department of Defense Facilities,* hearing, Subcommittee on Environment, Energy, and Natural Resources of House Committee on Government Operations, November 5, 1987, p. 91.

costs, but only after a lawsuit by the Federal government. Given the abysmal environmental records at numerous GOCOs, the Pentagon's standard for "gross negligence" must be remarkably high.

DOD's sweetheart agreement with its GOCO contractors not only cheats the taxpayer, but it diverts public funds from other military cleanup operations. It also suggests to contractors that they can get away with environmental recklessness again in the future.

In some cases, the Pentagon has actually rewarded contractors for their pollution. For example, the Air Force hired Hughes Aircraft to clean up the groundwater it poisoned in Tucson, so Hughes made a profit correcting its own mistakes. In fact, Hughes "gold-plated" its cleanup operation by building an expensive computerized control center. Though DOD prefers independent contractors, Parker testified that "situations can arise where it would speed the response if we look to the facility operating contractor to conduct the cleanup."[77]

GOCO Environmental Compliance: Who Pays?

GOCOs, unlike other federal installations, are clearly covered by the entire gamut of environmental legislation. They are required to file data with the EPA setting forth their annual toxic releases. EPA and state regulators can issue GOCO contractors orders and assess fines against them under RCRA. When EPA determines that the contractor, not DOD, violated federal law by mismanaging hazardous waste or failing to prepare required plans, it can issue a cleanup order. Bruce Diamond of EPA told Congress that it has issued three enforcement actions and assessed penalties at three GOCO facilities: the Ravenna Army Ammunition Plant (Ohio), the Lone Star Army Ammunition Plant (Texarkana, Texas), and Air Force Plant 4 (Ft. Worth, Texas).[78]

DOD does not usually pay GOCO penalties, legal costs, or settlement payments for RCRA violations. This DOD policy compares favorably with that of the Department of Energy, which reimburses all such contractors' fees.[79]

The actual cost of compliance, however, is borne by DOD. Herbert Fenster, a Washington attorney who specializes in GOCO representation, told Congress that contractors cannot legally initiate "**any** facility modification absent government approval and funding." He argued that the chief reason that GOCOs sometimes fail to comply with RCRA and other environmental statutes is that Congress fails to appropriate the funds. He testified:

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[77] *Overview of DOD Environmental Activities*, p. 265.
[78] *Ibid.*, pp. 360-361.
[79] "Hazardous Waste, Contractors Should Be Accountable for Environmental Performance," General Accounting Office (GAO/RCED-90-23), October, 1989, pp.15-24.

Case Study: Moffett Naval Air Station, Mountain View, CA

The Moffett Naval Air Station in Mountain View, California, a Superfund NPL site, sits in the center of the largest cluster of Superfund sites in the country. Moffett's restoration program illustrates how the environmental approach of military sites can influence—and be affected by—private companies with similar pollution problems.

Situated at the southern end of the San Francisco Bay, Moffett Field can easily be recognized by its three huge airship hangars, built in the 30's and 40's. The base has been the West Coast home and Pacific region headquarters for the Navy's fleet of land-based maritime patrol aircraft since 1962. In January, 1990, the Navy proposed that Moffett be closed.

For about four decades, the Navy dumped millions of gallons of toxic chemicals, such as solvents, oils, fuels, and paints on open fields at Moffett. Other chemicals leaked from underground storage tanks. Today Moffett officially has 19 toxic hot spots. The most serious problem is a large underground plume of toxic organic chemicals, including TCE.

Although approximately 272,000 people are served by drinking water wells located within three miles of Moffett, contamination from Moffett has apparently not yet entered that water supply. The Navy's toxic plume is "downstream" from the nearest public wells. In fact, one of Silicon Valley's 28 non-military Superfund sites lies directly between the municipal supply wells and Moffett.

When it became apparent that Moffett was cleaning up even more slowly than nearby electronics firms, the Silicon Valley Toxics Coalition (SVTC)—the citizen's group formed to monitor those private polluters—initiated a series of meetings with Moffett's neighbors. They took their call for faster cleanup to the press, legislators, and the EPA.

Now, representatives from SVTC actively participate in the quarterly meetings of the Moffett Technical Review Committee, asking questions not only about plans to remove the TCE plume, but also pinning down the base command on plans to prevent future contamination. The SVTC, which already has an EPA Technical Assistance Grant to monitor progress at IBM's south San Jose plant, is applying for another grant to oversee not only the cleanup effort at Moffett but at adjacent civilian Superfund sites.

With the spurring of SVTC, the Moffett officials have recently made an effort to inform the surrounding community about its contamination problems. It has issued numerous press releases, sent mailings to interested citizens and organizations, published glossy brochures, and staffed a booth at a local Earth Day fair. On-base military families have been kept informed as well.

However, though the Navy knew about Moffett's sproblems in 1983, it originally moved at a snail's pace to identify and clean up its hazardous waste sites. Official attention increased in 1987, when the base was added to the NPL. In 1989, the Navy negotiated its first ever interagency cleanup agreement, signed by two state agencies, EPA and the Navy.

Portrayed by the Navy as a breakthrough, the agreement has a major shortcoming. Other than the removal of leaking tanks and sumps, actual remedial action is not slated to begin until 1995, twelve years after discovery. While some time is needed to investigate the extent of underground contamination and hop through all the regulatory hoops, the delay provoked protests from the surrounding community.

Moffett's TCE plume has already merged with contamination from an adjacent private Superfund site, where a cluster of electronics companies—including Fairchild, Intel, and Raytheon—are located. Toxic solvents from the "MEW" site, named for the surface streets that define its boundaries, have already migrated and merged with the Moffett plume, which lies beneath a good portion of the Navy base.

MEW companies have dragged their feet, too, allowing their toxics to "seep in peace" while arguing over responsibility for the contamination. Although they have told EPA that cleanup might take from 50 to 300 years, they are still years ahead of Moffett in their cleanup efforts. Some MEW pollution has entered the deep aquifer that supplies a portion of Mountain View's drinking water. Even though MEW is "downstream" from the city's wells, high levels of pumping by the city could, over time, draw the pollutants into the water supply.

In 1989, when the Navy and its regulators announced their slow Moffett cleanup schedule, environmentalists weren't the only ones to complain. Representatives of the MEW companies charged that they could end up pumping the Navy's contaminants. (The Navy, of course, doesn't want to get stuck cleaning up after the electronics companies.) When the Navy finally signed a revised interagency agreement in late 1990, it only promised to speed up the removal of toxic sources, such as leaking underground tanks.

> Due to the cost-reimbursement nature of facilities contracts, the contractor is limited in its ability to comply with the environmental statutes, but more importantly, the GOCO contractor has no interest in failing to comply: he gets paid to do so and earns a profit on the work performed.[80]

The fact that the Pentagon generally bears the cost of GOCO environmental compliance leads to problems. First, such a policy provides the contractor with little or no incentive to redesign operations to reduce the use of hazardous materials. Pentagon officials responsible for GOCO reimbursement should coordinate more closely with contractors to assure that toxics use reduction is attempted before adding equipment to the "end of the pipe."

Second, in the case of most Air Force and Navy plants, the GOCO contract essentially provides free plant and equipment to the operator. This creates a market disadvantage for other contractors, who have to bid on development and production contracts without the benefit of these huge subsidies. Expanding this subsidy further by having DOD bear environmental costs is neither fair nor the best way to encourage genuine competition. Selling off GOCOs, as the military proposes, would solve this problem. But contractors are in no hurry to buy what they have been paid to operate, and the Pentagon cannot sell the highly contaminated properties on the open market.

Toxic Chemical Releases At Private Contractors

Because military contractors have to report their toxic chemical emissions like any other industrial enterprise, the public can get access to this information through the EPA's Toxic Release Inventory. A brief analysis of toxic pollution from California's largest military contractors provides a snapshot of what military contractors are releasing into the environment.

In fiscal year 1988, the Defense Department contracted for $151 billion in goods and services, but only the $137 billion in contracts greater than $25,000 were subject to detailed reporting requirements. Of that $137 billion, about 57%, or $76 billion, went for supplies and equipment.[81] DOD awarded $23 billion in contracts to California firms or the California branches of companies based elsewhere. The Defense Department published contract data showing that it awarded California's top eleven military manufacturers contracts totalling $13.5 billion, or about one-tenth of the national total.[82] Thus, the reports that these companies filed with EPA's Toxic Release

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[80] *Overview of DOD Environmental Activities,* p. 328.

[81] "Prime Contract Awards by Service Category and Federal Supply Classification, Fiscal Years 1988, 1987, 1986, and 1985," Directorate for Information Operations and Reports, Department of Defense, (DIOR/P07-88), pp.2-3.

[82] Company contract figures are taken from the *California Military Monitor,* Pacific Studies Center, October 1989, p. 6. They include all contracts over $25,000, and combined they total $13,544,589,000. Total

Inventory begin to give us an idea of the extent of military contractors' toxic releases nationwide.[83]

These California military contractors report releasing a variety of acids, metals, and solvents, as well as other hazardous wastes. They released a total of 169,000 pounds of chromium and its compounds, largely for disposal off site. Northrop's Hawthorne facilities accounted for nearly half of the chromium releases.

Aerojet-General, which produces rocket fuel at Rancho Cordova (near Sacramento) reported releasing nearly 18,000 pounds of hydrazine and its variants, primarily through off-site disposal, as well as 8,000 pounds of chlorine gas through its stacks. Both materials are extremely dangerous. Litton reported sending 10,000 pounds of polychlorinated biphenyls (PCBs) off site for disposal or treatment.

Solvents included methyl ethyl ketone, tetrachloroethylene, toluene, and xylene. McDonnell Douglas and Rockwell reported releasing trichloroethylene (TCE), a carcinogenic solvent no longer used by most firms. McDonnell Douglas sent most of its 13,000 pounds of TCE off site, while Rockwell released nearly all of its 79,000 pounds into the air. Rockwell also released over 1,000 pounds of carcinogenic benzene into the atmosphere.

Two of the most commonly used solvents were 1,1,1 trichloroethane (TCA), also known as methyl chloroform, and CFC-113. Both are major destroyers of ozone in the upper atmosphere, and TCA is toxic as well. The above eleven firms released 4,606,690 pounds of TCA in 1988. They emitted the bulk of the TCA into the air, but some firms collected the solvent waste and shipped it off site. The eleven companies also reported releasing 2,494,797 pounds of CFC-113 in 1988, 18% of the estimated annual statewide release of 14,000,000 pounds.[84]

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worldwide DOD contracts over $25,000 in fiscal year 1988 equalled $137,049,000.000. The tenth largest California contractor, the Aerospace Corp., is not a manufacturer, so we have excluded it from the total.

[83]"1988 SARA 313 Emissions/Releases as Reported to California Environmental Affairs Agency," custom printout, November 29, 1989. Reported Water, Underground, and On-Site Releases were nil or negligible. These reports, filed with EPA's Toxic Release Inventory (described in Chapter 2), give a rough idea of military contractors' toxics release nationwide, but they are not statistically representative. Not all California contractors reported releases for all their plants. On the other hand, most of these manufacturers do non-military work as well as Pentagon contracting. Furthermore, the top California contractors are concentrated in the aerospace industry, so the unique toxic releases generated by computer and chip companies, shipbuilders, and aviation fuel suppliers are underrepresented.

[84]Estimates are from Michael Belliveau and Julia May, "A Fragile Shield Above the Golden State: California's Contribution to the Chemical Destruction of the Earth's Protective Ozone Layer," Citizens for a Better Environment, April, 1989, p. 8.

Case Study: Aerojet-General, Sacramento, California

In 1979, a jogger reported seeing yellow muck in a pit on the property of Aerojet-General near Sacramento, California. That single report led to the discovery of widespread groundwater contamination and triggered a legal battle that took ten years to settle.

Aerojet-General, a subsidiary of Gencorp, is one of the country's largest aerospace contractors. It manufactures rocket motors for such missiles as the Air Force's MX intercontinental ballistic missile and NASA's Advanced Solid Rocket Motor. Many aerospace companies are being held responsible for hazardous waste pollution at off-site Superfund sites, and several operate plants, owned by the Energy and Defense Departments, that are on the Superfund NPL. Aerojet, however, is one of only a few major contractors that actually own their Superfund sites. It is also the largest emitter of toxic air contaminants in the Sacramento area.

Like many military bases, Aerojet's biggest environmental problem is contamination of the underground water supply, which now contains TCE and other toxic chemicals. Following the jogger's tip, the State of California filed suit against Aerojet in late 1979. It charged the company with releasing up to 20,000 gallons per day of hazardous wastes, including arsenic, sulfates, and phenols, into unlined ponds and a swamp. It said the firm allowed carcinogenic chemicals to overflow lined waste ponds and charged that the firm built a 3,500-ft. pipeline to bypass disposal sites, discharging the chemical wastes into a large unlined pit. The state found that pollution from the plant threatened the water supplies of thousands of homes.[1]

In June, 1989 after years of negotiations, Aerojet entered an agreement settling both the state lawsuit and a separate Federal suit. The firm agreed to contain the polluted groundwater, which was already seeping into the nearby American River, while developing a long-term cleanup plan. It promised to monitor the river and other nearby water supplies. The company did not, however, admit responsibility for damage caused by the pollution.

By the time of the agreement, Aerojet had spent $62 million on cleanup, and it expects ultimately to spend a total of over $100 million. However, despite its obvious responsibility for the mess, Aerojet might not be stuck with a large cleanup bill. The Armed Services Board of Contract Appeals ruled that Aerojet's cleanup efforts are a reimbursable cost of doing business; as a result, the Air Force is contributing $37 million. In addition, in April, 1989, a state Appeals Court ordered a group of 50 insurance companies to cover the cleanup costs under Aerojet's general liability policies. Should the state Supreme Court uphold that decision, Aerojet may return to the Air Force half the money it receives from the insurers.[2]

In addition to its own property, Aerojet operates Air Force Plant 70, a government-owned facility" next door." The Defense Environmental Restoration Program lists 12 toxic waste sites at the plant, and it is likely that the Air Force will pay for the cleanup of that portion of the Aerojet complex.

When the Sacramento Air Pollution Control District surveyed the emitters of toxic air contaminants in the county, it found that Aerojet topped the list with 224,650 pounds in 1986-1987.[3] Among other practices, Aerojet, like other producers and users of solid rocket fuel, burns waste fuel in open pits. To reduce and control its air emissions, Aerojet is seeking approval for a demonstration "thermal processor"—i.e. an incinerator. This incinerator would represent a step forward from open burning, but would still pose environmental hazards. It would make much for environmental and economic sense for Aerojet to scale up the Army's new method for recycling rocket fuel oxidizer (ammonium perchlorate), by dissolving it in pressurized ammonia.

When the U.S. Senate considered the Clean Air Act last year, Aerojet lobbied for an amendment which, in the interest of "national security," would have exempted rocket-testing from local air pollution regulation in exchange for offsetting fees. State and local officials successfully lobbied to weaken this amendment, sponsored by Sen. John Warner (R-Virginia). Nevertheless, Aerojet displayed an attitude consistent with other military contractors: that in the interests of "national security," it should have a license to poison.

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[1] Bill Wilson, "State Charges Pollution in Suit Against Aerojet," *Sacramento Bee,* December 27, 1989.

[2] "Insurers Must Pay Cleanup Cost for Toxic Polluter," *San Jose Mercury News* (Associated Press), April 21, 1989; Kathryn Eaker Perkins, "U.S. to Pay Aerojet $32 million for Cleanup," *Sacramento Bee,* February 28, 1990.

[3] Annette R. Carruthers and Clark Brink, "Toxic Air Pollutant Inventory for Sacramento County," Sacramento Air Pollution Control District, February, 1988, Table 2.5.1. McClellan Air Force Base was second.

TABLE 6

Toxic Releases of California's Top DOD Contractors, 1988

(thousands of pounds)

Company Locations	California Contracts ($ thousands, 1988)	Air Emissions Fugitive	Air Emissions Stack	Sewage	Off-site	Total
McDonnell Douglas Culver City, Huntington Beach, Long Beach, Monrovia, Torrance	2,880,365	972	1,311	54	389	2,732
Lockheed Burbank, Ontario, Palmdale, Palo Alto, Sunnyvale	2,374,663	413	1,251	135	168	1,967
GM-Hughes Carlsbad, El Segundo, Fullerton, Irvine, Long Beach, Newport Beach	1,798,743	1,014	15	114	166	1,308
Rockwell Canoga Pk., Downey, El Segundo, Newbury Pk., Newport Beach, Palmdale, Simi Hills	1,682,967	234	806	7	189	1,234
General Dynamics Pomona, Rancho Cucamonga, San Diego	1,483,819	478	170	20	319	987
TRW Manhattan Beach, Redondo Beach, San Diego	1,024,068	3	363	213	5	585
Aerojet-General Downey, Rancho Cordova	636,110	307	506	108	524	1,450
FMC Fresno, Madera, Newark, San Jose	532,592	88	160		121	369
Ford Aerospace (Loral) Newport Beach, Palo Alto	436,580	69	23		10	102
Westinghouse Sunnyvale	354,828	47	4	1		53
Litton Industries San Carlos, Sunnyvale, Woodland Hills	339,854	62	13	18	23	115

Source: California Environmental Affairs Agency

Two major California aerospace plants are on the National Priorities List of Superfund sites: Aerojet at Rancho Cordova and Westinghouse in Sunnyvale. Other major Silicon Valley military contractors, including FMC, Ford Aerospace (Loral), and United Technologies, have cleanup problems, but they have not qualified for NPL status. Several other area high-tech firms with military business, such as Teledyne, Watkins-Johnson, and TRW, are also on the NPL. Furthermore, government-owned

plants in the Sacramento area (Aerojet-General), Palmdale, (site of Northrop, Lockheed, and Rockwell, among others), Pomona and San Diego (General Dynamics), and Sunnyvale (Lockheed) account for a total of 61 potential toxic "hot spots."[85]

While military contractors are by no means the only companies that are contaminating the U.S. environment, they have less incentive than commerical firms to reduce their toxic releases. Many weapons contracts are awarded on a cost-plus basis, which means that contractors can charge DOD for the addition of new pollution control equipment, remediation of on-site groundwater contamination, or even payments for cleanup at landfills for which the contractor is a PRP. In addition, the Aerospace Industry Association is asking the Defense Acquisition Review Council to treat the Superfund tax as an allowable (reimbursable) cost under their contracts.

Despite the contention of contractors and their friends in the Pentagon, pollution should not be considered an ordinary business practice and cleaning up toxic waste should not be considered a normal cost. Instead of reimbursing reckless contractors, the Pentagon should channel the funds into its own underfunded environmental programs. This is not only fair, it would force contractors to weigh the long-term environmental costs of their production activities. It would also force them to build environmental compliance and pollution prevention techniques into their contract bids.

Furthermore, military contracts should contain language which simultaneously rewards environmental responsibility and foresight yet holds contractors liable for their past and present mistakes. The cost-plus-award-fee contract, in which the contracting agency reviews performance to award fees above costs and a fixed profit, may lend itself to such reform. The General Accounting Office has suggested that DOD enact rules requiring "all award-fee contracts to include environmental performance as a distinct evaluation area."[86] To prevent abuse, specific criteria should require DOD to evaluate environmental failures as well as accomplishments.

Secrecy Hides Environmental Negligence

In many cases, military secrecy makes it hard to keep military contractors accountable. Work areas are routinely placed off limits for building inspectors, fire marshals and environmental regulators.

> In Sunnyvale [California], sewer inspectors—who among other things, watch to see that hazardous materials aren't dumped into the system—in some cases have

[85] *DERP Annual Report for 1989,* p. C-8. In the Sacramento area, Air Force Plant 70 is actually adjacent to Aerojet's privately owned NPL site. When litigation is resolved, the entire Aerojet complex may be considered one NPL site. Lockheed also has contamination at its privately owned property surrounding its Naval Industrial Reserve Ordnance Plant.

[86] "Hazardous Waste, Contractors Should Be Accountable for Environmental Performance," p. 29.

> decided that rather than face months of delay, they must accept the word of Lockheed Missiles & Space Co. that no illegal discharges are coming from secret areas. They've even been told they might have to be blindfolded before being taken to a site.[87]

Some highly classified projects use new materials that regulators do not know. Both the F-117A Stealth Fighter and B-2 Stealth Bomber were developed behind a heavy curtain of secrecy. They both use composite materials, developed to absorb rather than reflect radar energy. Composites are generally made from plastic resins and carbon fibers. Years after Lockheed began production of the F-117A at its Burbank, California "Skunk Works," workers began to complain of health problems. About 240 Lockheed workers filed worker-compensation claims, charging that exposure to "exotic plastics have caused them to suffer illnesses ranging from memory loss to cancer."[88]

Debarment

In principle, government contractors who violate certain environmental laws, such as the Clean Air Act or Clean Water Act, risk a powerful sanction, "debarment." If they are convicted of criminal violations, they are automatically listed as ineligible for federal contracts. In addition, the EPA Assistant Administrator for Enforcement can list a company for "recurring or continuing violations" of either act. Such discretionary cases are normally "recommended" by EPA regional administrators, but anyone can request debarment as long as EPA or a state agency has initiated, but not necessarily completed, an enforcement action. The owner or operator of a non-complying facility is first given an informal hearing before a case examiner. If the case examiner recommends listing, the violator can pursue formal appeals to the EPA Office of General Counsel and eventually to the federal courts.

In practice, however, it is extremely difficult to debar a contractor, especially a large one like Northrop, Boeing, or Lockheed. Under the law, the Pentagon can exempt a debarred company from procurement bans where national interests dictate it. Given the "imperatives" of military procurement, the Pentagon "needs" such companies as much as the companies need the Pentagon, and thus exemptions, contrived settlements, or debarments of just one branch of a violating company can work around the limitations of the debarment law. In fact, the Justice Department couldn't even get Northrop debarred, under other legislation, after the company plead guilty to 34 counts of felonious criminal fraud.[89]

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[87]Christopher Schmitt and Evelyn Richards, "Security at Some Defense Firms Blocks Pollution Watchdogs," *San Jose Mercury News,* September 18, 1988, p. 1A.
[88]*Los Angeles Daily News,* reprinted in the *San Jose Mercury News,* February 3, 1989.
[89]"Justice Dept. Seeks to Bar Northrop from Military Work," *Los Angeles Times,* printed in *San Francisco Chronicle,* July 27, 1990, p. A16.

Specifications: The Military's Anti-Environmental Fulcrum

The military's threat to the American environment extends far beyond the thousands of bases where contamination is now known to exist. Military purchasing power is, in fact, driving much of the environmentally destructive behavior of our entire economy.

The military is a major consumer of hazardous materials. Military purchases directly account for 13 to 16 percent of the U.S. final-demand chemical market.[90] In addition, military contractors, particularly weapons manufacturers, are major buyers of chemicals and other hazardous materials.

For example, in 1986 the U.S. military and its contractors purchased half of the 150 million pounds of CFC-113 (chlorofluorocarbon-113, also known as Freon) used in the U.S. CFC-113 vapors break down the ozone layer, in the upper atmosphere, that protects the Earth from deadly ultra-violet solar radiation. In 1988, military contractors were responsible for 55 percent of the industrial CFC-113 releases in Florida. In 1986, the Navy and Air Force accounted for 16 percent of the combined U.S. emissions of two other ozone-depleting chemicals, Halon 1211 and Halon 1301. Thus, in the name of national defense, the military has been a major culprit in destroying the Earth's protective shield.[91]

These purchases are guided by military procurement specifications, or "mil-specs," which apply both to purchases by the military and by its suppliers. Mil-specs have virtually created the market for a number of extremely destructive materials, such as cadmium, methyl chloroform, and ozone-destroying CFC-113. Often contractors are prepared to shift to less hazardous materials, but are hamstrung by the regulations.

William Parker, the Pentagon's top administrator for environmental affairs, explained the far-reaching impact of the Pentagon's requirement for the use of CFC-113:

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[90]In some chemicals, the military's share is much higher; in others, much lower. These figures do not include contractors' consumption, and neither the numerator nor denominator includes chemicals further processed into other commodities, such as plastics. Interindustry Economics Division, U.S. Commerce Department, "The Input-Output Structure of the U.S., Economy, 1977," and "Annual Input-Output Accounts of the U.S. Economy,. 1982," *Survey of Current Business*, May, 1984 (p. 57) and May, 1989 (p. 39).

[91]William H. Parker, III [Deputy Assistant Secretary of Defense (Environment)], "CFC's and Halon Use Reduction within the Department of Defense," paper presented to the United Nations Environmental Programme seminar on "Substitutes and Alternatives to Chlorofluorocarbons (CFC's) and Halons," October 20, 1988. The Florida data is based upon TRI data for contractor facilities receiving more than $10 million from DOD in fiscal year 1988.

> A shift away from CFC-113 is difficult, especially for the production of military equipment, because U.S. military specifications for soldering and cleaning as written discourage the use of alternative non-ozone depleting materials. These specifications have become the de facto world standard for electronic equipment manufacture for a variety of reasons: the military is a large customer and defense pacts with our allies internationalize standards; companies often produce their entire product line to qualify for possible military purchase; companies produce commercial electronics to these standards because they are assumed to be a mark of quality; and foreign standards cite military specifications even for civilian applications.[92]

Some specialized military specifications may have little impact on commercial industry as a whole, but the specified materials nevertheless harm the environment. For example:

> The military specifications for paints and primers... require high solvent content paints and primers in order to satisfy the military missions because only high solvent content paints and primers provide sufficient corrosion protection at high altitudes. Thus, in order to comply with both the environmental requirements and the military specifications, the contract must place [expensive] add-on controls on the facility to reduce the number of VOCs [volatile organic compounds] that reach the atmosphere.[93]

The Army requires similar paints for ordnance (missiles and ammunition). In one case, a contractor—NI Industries—was unable to meet Southern California's air emissions standards through toxics use reduction, because the Army would accept no substitutes. NI found a less toxic paint that met the Army's performance standards while allowing NI to meet environmental goals, but the Army rejected that coating because it was only available from a single source. Instead of relaxing its specifications to encourage pollution prevention, the Army agreed to reimburse NI for the cost of installing pollution-control equipment.[94]

The Pentagon now recognizes, in principle, that many of its specifications for products are environmentally unsound, and it is taking steps to change some of them. For example, the armed services and Defense Logistics Agency have so far reviewed 50 specifications calling for cadmium coating, and they are proposing substitutes, such as zinc, for each one.[95]

Faced with an international treaty requiring the phase-out of ozone-depleting CFC-113, as well as a Congressional directive, the military is working with private

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[92] *Ibid.*, p. 14.
[93] Testimony of Herbert Fenster, *Overview of DOD Environmental Activities*, pp. 333-334.
[94] *Environmental Compliance by Federal Agencies*, pp. 336-338.
[95] *DERP Annual Report for FY1989*, p. 18.

manufacturers to develop and test alternative products and specifications. Unfortunately, the CFC-reduction effort, like most changes in Pentagon policy, is proceeding at a snail's pace. Commercial electronics manufacturers have already implemented alternate, water-based cleaning methods, but the Pentagon has not yet given them the mil-spec stamp of approval. The American Electronics Industry told Congress:

> The [CFC phase-out] pace may be accelerated and additional compounds added to the list of compounds to be eliminated. Failure to act now will jeopardize the electronic industry's ability to provide quality products to the military and DOD's ability to maintain first quality defenses.[96]

While we applaud the early initiatives of the military toward changing its specifications, the effort should be broadened so that there is a systematic review and overhaul of all military specifications and materials, resulting in a step-by-step elimination of the worst hazardous materials. When suppliers offer non-toxic alternatives to hazardous mil-spec materials, the Pentagon should be prepared to accept them, if they meet performance standards, without waiting for the lengthy development of new specs.

The Potential for Pro-Environment Purchasing Power

Military purchasing comprises such a large portion of the US economy, that major pro-environment shifts in DOD purchasing rules could help to redirect industrial practices throughout the US and even worldwide. For instance, in the 1950's, the military provided a large market for early, high-priced transistors, subsidizing improvements in manufacturing techniques that turned semiconductors into inexpensive commercial commodities. The same thing happened with integrated circuits:

> In the early 1960's the Air Force, which needed to squeeze an intricate guidance system into the nose cone of the Minuteman intercontinental missile, subsidized the early development of chip technology with hundreds of millions of dollars in purchases. It is ironic that the technology that brought computers, video games, and electronic auto ignitions to the American consumer arrived in the deadly tip of a rocket designed to rain thermonuclear fire half a world away.[97].

Today, solutions to America's problems with toxic pollution, energy production, and garbage disposal could be placed within reach if a similarly intensive national investment were made in nontoxic materials, solar equipment, energy-efficient and

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[96]Mark Stanga, Litton Industries, "[Testimony of the] American Electronics Association before the House Armed Services Committee Panel on Environmental Restoration," March 6, 1990, p. 6.
[97]Lenny Siegel and John Markoff, *The High Cost of High Tech,* Harper and Row, 1985, pp. 8-9.

nonpolluting vehicles, and the production and utilization of recycled materials. A military commitment to purchase recycled materials, such as paper, would not only boost the market directly, but it would help drive down the cost of reprocessing, making recycled goods more competitive on the open market. The need for garbage-burning plants and landfills would be sharply diminished. If the federal government spent all of its $7 billion in annual vehicle purchases on fuel-efficient, nonpolluting vehicles, Detroit would quickly change its ways.

Military R & D Can Take on Toxics

The military, through its Manufacturing Technologies (ManTech) programs, is positioned to promote nontoxic materials use and non-hazardous production methods, not only within the military sector, but within the industrial economy as a whole. The Army has already established a program to do exactly that, and we believe it should serve as a model for all military ManTech activity.

Military-funded research and development has been a major driving force in American technological innovation since World War II, setting new standards for industrial automation and materials fabrication. At first, the military disseminates its findings to military contractors, but the Pentagon, when pushing its R & D budget through Congress, often justifies ManTech work as a boost to the commercial economy as well. Certain ManTech programs are controversial, for they hasten the displacement or deskilling of industrial workers, but there is no question that ManTech is an efficient way for the government to influence industrial technology.

The Army Materiel Command, without any direction from outside, has established the Environmentally Acceptable Materials, Treatments, & Processes ManTech Thrust, with four objectives:

> 1. Develop a comprehensive program to ensure the technologically complete and timely validation of manufacturing processes for environmentally acceptable materials.
>
> 2. Avoid possible closure of manufacturing facilities due to use of environmentally unacceptable materials or manufacturing practices.
>
> 3. Mitigate personnel hazards associated with environmentally unacceptable manufacturing methods/processes.
>
> 4. Reduce or eliminate associated costs of handling, treating, and disposing of hazardous waste attendant to manufacturing methods and processes.[98]

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[98]"U.S. Army Manufacturing Technology (MANTECH) Major Thrust, *Environmentally Acceptable Materials, Treatments, & Processes,"* Army Materiel Command, Fiscal Year 1991, p. 3

Among its initial tasks, the Army research program is exploring alternatives to cadmium coatings, CFC solvents, and chromic acid rinses., and it is pursing the development of higher efficiency paint sprayers, ion implantation for finishing aircraft parts, and mechanical paint stripping.

We believe that all military ManTech programs should have an environmental component: research to minimize the environmental costs of production. In particular we support the program of the Campaign for Responsible Technology to pressure the Defense-supported semiconductor manufacturing technology consortium, Sematech, to establish environmental goals.[99]

Sematech is a joint research venture organized by 14 U.S-owned high-tech companies. About half of its budget, $100 million a year, come from the Defense Advanced Research Projects Agency. Sematech hopes to devise methods and equipment for producing silicon integrated circuits based upon microscopic submicron features. Its purpose is to help U.S.-owned companies outperform their Japanese rivals.

Semiconductor production consists of an extremely complex series of steps requiring the use of toxic gases, solvents, photographic chemicals, acids, and other hazardous materials. The industry has been plagued for years by environmental and occupational health problems, but thus far it has only invested its remarkable technological capability in cleanup efforts and end-of-pipe controls that shift pollutants from one location to another, rather than in true pollution prevention.

The industry's structure has itself discouraged pollution prevention. Most companies are not large enough to undertake research programs that are unlikely to yield immediate competitive advantages. Furthermore, the semiconductor manufacturing equipment firms that are responsible for most improvements in process technology do not directly face the costs of pollution. Sematech, as a joint venture backed by the Federal government, is ideally situated to overcome such obstacles. It has already established a program to work closely with U.S.-owned suppliers of semiconductor equipment and materials. Now it needs to set some environmental goals.

Worker Displacement

As a general principle, the National Toxic Campaign Fund believes that the workers who produce or use hazardous materials should not bear the brunt of efforts

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[99]For more information about the Campaign for Responsible Technology, contact Ted Smith (Chair) at the Silicon Valley Toxics Coalition (408/287-6707) or Rand Wilson (Coordinator) at the Labor Resource Center (617/391-3866).

to reduce the use of toxics. Yet unless part of a broader strategy, programs designed to alter military purchasing policies can lead to extensive lay-offs and plant closures. The Army, in its environmental ManTech thrust, has identified two things that the Defense Department can do to ease the employment impact of pollution prevention: It can develop new manufacturing technologies to reduce the risk of plant closures, and it can develop ways to protect workers from exposure to hazardous materials on the job.

But a third, equally important initiative is necessary, a DOD counterpart to the proposed Superfund for Workers. As the Pentagon develops new specifications and purchasing priorities, it needs to identify the employment impact of those changes. When workers lose their jobs as a result of Pentagon pollution prevention policies, the military should offer retraining and direct assistance to help them make the transition to new employment.

Recommendations

Military purchasing power is driving and defining a large part of the environmentally destructive behavior of the U.S. and world economy. There is a pressing need to re-evaluate every step of the procurement process, from contracts with the private sector, to specifications for the goods and materials that the military utilizes, and to the R & D that is setting the course for the future.

1. Unless it is directly responsible for the pollution, the Defense Department should not pay the cleanup expenses, on-site or off-site, of its contractors. Military contractor pollution should not be considered "an ordinary business expense" that gets billed to the American taxpayer. DOD should stop paying for the environmental crimes of both GOCOs and contractor-owned facilities. DOD should devise contract language that rewards contractors for environmental responsibility and holds contractors liable for past and present pollution problems.

2. NTCF supports Federal legislation that would add a debarment provision to the Resource Conservation and Recovery Act. Its enactment would give citizens the opportunity to force contractors to defend their hazardous waste management practices.

3. By the end of 1991, DOD should review and eliminate wherever feasible all military specifications requiring the use of substances that cause, or probably cause ozone layer destruction, cancer, birth defects, or nervous system injuries.

4. DOD should review all procurement practices that affect the environment, and it should give priority to the purchase of non-polluting, high fuel efficiency vehicles, photovoltaic cells, recycled paper and other goods, and even fruits and vegetables grown without any cancer-causing pesticides and herbicides.

5. The Pentagon should expand the number of military Manufacturing Technology projects focused on pollution prevention, and all ManTech projects dealing with hazardous materials should devote a portion of their resources to toxics use reduction.

6. Ten percent of the Sematech annual budget should be devoted to reducing the use of hazardous materials in the chip production process. The Sematech consortium should evaluate the environmental impact of each new technology it considers, rejecting those that are likely to increase toxic hazards. It should establish an advisory board, with representatives from environmental and labor groups, to oversee this program. Furthermore, all environmental technology developed by Sematech should be disseminated, for a fee if necessary, throughout industry.

7. The Pentagon should establish a Worker Displacement Fund to aid in the retraining and transitional support of workers who lose their jobs as a result of military pollution prevention policies.

Chapter 5

Over There: Contamination at Foreign Bases

Published U.S. government reports on hazardous waste management and contamination routinely leave out the approximately 120 major foreign installations of the U.S. military. The annual Defense Environmental Restoration Program report lists contamination sites at virtually every major U.S. military facility and most minor properties within the U.S. and its territories, but it ignores all foreign bases. Even the General Accounting Office, usually a good source of public information on government abuses, has been silenced in making what it knows public. In 1986 GAO studied the hazardous waste activities of DOD's foreign facilities, but the Pentagon has classified the report at the request of U.S. diplomats. Another GAO study, now underway, is also being kept secret.

Nevertheless, independent investigations—and a recent Army memo—suggest that foreign bases are as polluted as their domestic counterparts. U.S. overseas facilities are polluting the land, groundwater, and surface water wherever they operate. With no effective mechanism for enforcing, let alone monitoring, environmental compliance, overseas bases have run up a cleanup and compliance bill which could add billions of dollars to the national debt if the U.S. accepts responsibility, and which will estrange us from our closest allies if we do not.

At bases everywhere, from Europe to the Philippines, the U.S. military has left its toxic calling card. The *Los Angeles Times* reports, "The Air Force has acknowledged that it has polluted the soil, streams, or ground water at every one of its airfields in Europe."[100]

From 1954 until its closure in 1970, a U.S. Army radar station on Iceland's Mt. Heidarfjall deposited some twenty million pounds of untreated rubbish, including substantial quantities of toxic waste. Today the property's owners say the pollution from the radar base, seeping down through the mountain, is preventing them from carrying out a major aquaculture development. They are seeking US$182 million in damages from the Army.[101]

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[100]John Broder, "U.S. Military Leaves Toxic Trail Overseas," *Los Angeles Times*, Monday, June 18, 1990., p. A15.

[101]Since the U.S.-Iceland agreement that allowed for the station's establishment purported to absolve the U.S. of liability, it is not clear whether any court, in U.S. or Iceland, will accept jurisdiction.

Widespread Contamination in Germany

Germany, with the greatest concentrations of U.S. troops abroad, may have the largest number of U.S. contaminated sites of any foreign country. For years, DOD attempted to keep a lid of the subject. An internal Air Force memo explains why:

> The AF has been hesitant to identify and investigate sites because of the potential political ramifications. They have a technical/political dilemma. If they identify sites, do nothing, and the Germans find out, they have problems. If they don't do anything and the Germans identify [that] the pollution exists, they have problems.[102]

However, the truth, along with the contamination, has started to leak out. Following a *Los Angeles Times* exposé last June, the Army disclosed that it had identified 358 contaminated sites in West Germany alone. Of the total, at least 30 are on bases slated for closure. The Army, which tends to underestimate cleanup costs during the initial assessment of contamination, figures that 26 hot spots will require more than a million dollars each to clean up.[103]

The Germans already know about many of those sites. Contractors preparing to expand the Frankfurt Airport discovered in 1989 that a Rhine-Main AFB jet fuel leak was contaminating subsurface water supplies. Residents of the community of Roth now know that until last year the U.S. Air Force base at Bitburg was not treating its industrial or domestic waste; the base pipeline dumped solvents and other chemical wastes directly into the town's central creek. An official drinking water sampling program detected the contamination at Mannheim. At Bad Kreuznach, "Four civilian employees, including one American, were indicted by the West Germans for groundwater contamination..."[104]

At some contaminated bases, local German officials are taking part in the cleanup effort and seeking reimbursement from the U.S. At the Germersheim Army Depot, for example:

> Leakage from underground piping in the 1970's resulted in soil and groundwater contamination by heating oil. Several hundred cubic meters have been spilled. Since the leakage was detected in 1986, host nation officials were involved in the remedial process. A NATO SOFA [North Atlantic Treaty Organization Status of

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[102]Jeremiah McCarthy, "Trip Report to the Hague and EUCOM," Memorandum for the Record, Office of the Assistant Secretary of Defense, Production and Logistics, November 3, 1988, p. 3.
[103]Untitled U.S. Army memo, 1990.
[104]Broder, "U.S. Military Leaves Toxic Trail Overseas," p. A16.

Forces Agreement] claim was filed by German local officials in the amount of $16 million for cleanup.[105]

In its internal documents, the Army alone estimates its long-term German cleanup bill to be $162 million. Though this figure is probably low, in official military budget submissions known as A-106 reports, DOD projects spending only $1 million dollars on cleanup in Germany over the next five years, and a miserly $2 million worldwide. The Pentagon also plans to spend about $83 million on sewage treatment facilities at 83 projects in Germany in the same time frame.[106]

The Philippines May Be Worse

The Philippines, with the largest U.S. foreign bases, may have the worst problems. David Berteau, a top Pentagon official, says: "If there's a horror story out there...Subic [Bay Naval Station] may be it."[107] Subic's ship repair facility, a major industrial complex, has reportedly released tons of chemical wastes into the bay. However, it doesn't have to worry about meeting environmental standards because the Philippines has none.

Official Pentagon records show that the Subic Bay base turned over up to 60,000 gallons of waste oil, as well as small amounts of other waste chemicals, to the Pentagon's Defense Reutilization and Marketing Service (DRMS) for disposal.[108] While it is not known how DRMS disposed of most of the wastes it was reported to have received, the more significant question is what became of the far larger volumes of used solvents, paints, and plating wastes undoubtedly produced by the shipyard. While U.S. regulators are attempting to force domestic shipyards, such as Portsmouth in Maine, to comply with environmental standards, no-one is watching the store in the Philippines.

Another big problem in the Philippines exists at the Clark Air Force Base. This complex contains the Crow Valley Bombing and Gunnery Range, the only major U.S. target range in the West Pacific. Should the U.S. close the range, the Philippine government may attempt to require the Air Force to underwrite the enormous, costly

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[105]Untitled U.S. Army memo, 1990.

[106]"Number and Estimated Cost of Foreign Pollution Abatement Projects by Environmental Media Proposed for All Fiscal Years for All Federal Agencies," and "Number and Estimated Cost of Foreign Pollution Abatement Projects within Foreign Facilities by Environmental Media Proposed for All Federal Agencies for All Fiscal Years," custom printout, Environmental Protection Agency Office of Federal Activities, 1990.

[107]Broder, "U.S. Military Leaves Toxic Trail Overseas," p. A16.

[108]A few categories of military waste are shipped back to the U.S. for disposal. In fiscal 1989, Subic sent 206,140 pounds of waste containing PCBs to Alameda, California. Presumably this consisted of transformer oil, but it may have included hardware as well. Subic also sent a total of 6,033 pounds of the pesticide chlordane to Alameda and Ft. Lewis, Washington.

task of deactivating unexploded bombs and shells and removing explosive byproducts from the land. Without such an effort, the area could not safely be put to any other use.

Over the next five years (fiscal 1991 through 1995), U.S. bases in the Philippines propose to spend less than $9 million on pollution abatement projects. Air Force projects, including work dealing with air pollution, wastewater, and toxic substances, account for more that ninety percent of the anticipated total. However, the largest expenditure, $3.6 million (including possible Navy spending), is meant to provide for safe drinking water for base residents and employees, not to protect the Philippine environment or its people.[109]

Around the World: A Toxic Arsenal for Democracy

The Defense Reutilization and Marketing Service, while ostensibly responsible for disposing or transferring containerized hazardous waste from the armed services, has no clear idea how much waste it handles overseas. Since it does not use standard units of measurement, it only offers useless monetary summaries, created from arbitrary values it assigns to wastes, such as a penny a gallon for toxic sludge.

Most hazardous waste is disposed of or sold in the country in which it is generated, but certain particularly hazardous materials, such as PCBs and ammunition boxes treated with pentachlorophenol (PCP) are often "retrograded" to the U.S. or sent to third countries. For example, the U.S. currently ships military toxic wastes from Turkey, Greece, the Azores, and Iceland to England for disposal.[110] The Pentagon says this practice meets British requirements, but the British government is either unaware or unwilling to admit that it imports Pentagon wastes

With so many environmental problems crossing national borders—acid rain, global warming, ozone depletion, ocean pollution—it is important that U.S. practice be exemplary. How can we expect poor countries not to cut their forests, or our industrial competitors to reduce air pollution, if we continue releasing toxic materials into our allies' backyards? In the long term, the U.S. will lose its credibility and relationships with our allies if we ignore our overseas hazardous waste problems. What is worse, the longer we wait to clean up our messes abroad, the more the wastes disperse into the environment, causing even more damage and resentment in the host nations.

Many members of Congress who are concerned about the U.S. military's toxic legacy nevertheless feel that host nations—especially wealthy ones such as Japan and Germany—should pay the cost of cleanup, arguing that decades of U.S.

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[109]"Number and Estimated Cost of Foreign Pollution Abatement Projects by Environmental Media" and "Number and Estimated Cost of Foreign Pollution Abatement Projects within Foreign Facilities."

[110]David J. Berteau, Principal Deputy Assistant Secretary of Defense (Production and Logistics), Statement before the Environmental Restoration Panel, House Armed Services Committee, March 21, 1990, p. 11.

Radiation

In October, 1986, Air Force personnel at Wright-Patterson Air Force Base in Ohio accidentally opened a drum containing americium—a radioactive, toxic, carcinogenic element, contaminating the building in which it was stored. The Air Force spent about one million dollars to clean and dismantle the building, and in the process several cleanup workers inhaled small amounts of the substance.

DOD faces the same intractable radioactive waste problems as the Energy Department, though on a smaller scale. Radioactive waste poses particularly difficult "disposal" challenges because virtually anything that comes into contact with it becomes contaminated, and because there is no place to put it that will contain the radiation—at least, from materials with long half lives—as long as the radiation remains a threat.

Pentagon radioactive waste includes spent fuel from naval propulsion systems, dismantled reactors including ship and submarine engines, devices illuminated with tritium, biomedical isotopes, depleted uranium shells, and equipment and garments used to handle other wastes. It is not managed by the same Pentagon agencies that have responsibility for toxic wastes, and the Nuclear Regulatory Commission, not EPA, holds the primary oversight role.

In the long run, the safety of Pentagon radwaste disposal programs is inextricably linked to the larger task of finding ways to isolate the waste generated by commercial reactors and Energy Department nuclear weapons plants. In the near term, the military's programs for cleaning up old waste sites, storing wastes, and disposing of new wastes, suffer many of the same inadequacies as military efforts to manage toxic wastes.

In response to the Wright-Patterson accident, the General Accounting Office examined the military's low-level radioactive waste disposal practices. The study did not look into high-level wastes, such as reactor fuel rods. Nor did it review the decommissioning of naval reactors—which are dismantled and then buried at the Energy Department facility in Hanford, Washington. But it still painted a disturbing picture. The Defense Department has no unified procedures for dealing with radioactive wastes, and its knowledge of past and present waste volumes is incomplete.

The Air Force, for example, plans to dig up low-level wastes that it buried, during the 1950's, at 46 separate bases, but it does not know how much waste is buried at each site. GAO says, "the Navy does not precisely know the amount and types of wastes stored or disposed of by its various installations."[1]

Even after fuel rods are removed from decommissioned nuclear reactors, the cost of disposing of the massive structures—probably by burying the vessels at Hanford—is enormous. The Air Force expects to spend $20 million to $40 million to dispose of a reactor and other waste from Wright-Patterson. The Army says it will cost at least $14 million to dismantle a nuclear reactor at the Watertown Arsenal, in Massachusetts.[2]

The Army, Air Force, and a few Naval installations ship their wastes to three privately owned dumps, in South Carolina, Nevada, and Washington state. Other Naval installations store their low-level waste, increasing the chance of another spill.

Future access to disposal sites is by no means certain. State regulators have at times denied the Army access to existing dumps for packaging violations. Also, unless changes are made in the new, national system for low-level radwaste disposal, by 1993 the military will be required to dispose of wastes in the regions where they are generated. Yet most of those sites will not be ready until much later. The military, as well as other generators of wastes, will probably end up storing larger and larger quantities of waste, and the pressure will increase to allow the release, into the environment, of materials with relatively low levels of radiation. In addition, the new (1993) U.S. system for radwaste disposal does not provide for the disposal of waste from foreign military bases.

Despite the uncertain future of military low-level radwaste disposal, the Pentagon has no comprehensive program for resolving its problems. We call for the creation of a high-level Defense Department office, affiliated with an umbrella hazardous waste management program, responsible for establishing and carrying out a comprehensive program for monitoring, reducing, and isolating radioactive wastes of all types.

Finally, thus far the military's efforts to minimize radioactive waste have focused upon the consolidation of wastes. Instead, given the health risks, environmental danger, and high disposal costs inherent in the generation of radioactive waste, the Pentagon should question all of its uses of materials that generate radioactive waste.

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[1] "Nuclear Regulation: The Military Would Benefit from a Comprehensive Waste Disposal Program," GAO/RCED-90-96, Mar., '90, p. 17.

[2] Seth Shulman and Dan Grossman, "Toxic Secrets," *Boston Magazine,* November, 1989, p. 219.

protection has made those countries secure and prosperous. In fact, Congress decided late in 1990 that "the environmental restoration of bases used by the United States in foreign countries is a host nation responsibility."[111]

While such liability may eventually be negotiated with many host country governments, telling foreign governments that they must pay to clean up pollution caused by U.S. forces may drive a wedge between the U.S. and many of its allies.

Who is Minding the Store at Foreign Bases?

In theory, U.S. bases abroad are required to meet the environmental standards of stateside installations. U.S. environmental laws do not cover U.S. operations abroad, but under Executive Order Number 12088, overseas facilities are required to match the standards written into those laws. In reality, no U.S. or foreign agency has the authority to enforce or even monitor environmental compliance at foreign U.S. installations. U.S. bases abroad are governed by status of forces agreements with each host country, and those agreements say little about environmental protection.

EPA currently plays only a minor oversight role. It receives A-106 budget statements from the armed services and other federal agencies projecting their overseas pollution abatement costs. Over the next five years (fiscal years 1991-1995), all Federal agencies anticipate spending $341 million on pollution abatement (primarily on pollution controls for air and water pollution) outside the fifty states and District of Columbia). The Pentagon, with the largest overseas presence, expects to pay out $310 million or 91% of the total. Out of this, $63 million, or 18% of the total, will be spent in U.S. territories.[112]

U.S. commanders overseas acknowledge their environmental problems and regularly request additional funding. The U.S. Air Force Europe Environmental Policy Council told Deputy Assistant Secretary of Defense Parker that in West Germany "the specter of criminal charges, especially concerning groundwater pollution, is present; they would like DERA [Defense Environmental Restoration Account] money also for cleanup; hazardous waste is recognized as a rapidly growing issue..."[113]

Congress took a small step forward when it passed the fiscal year 1991 Defense Authorization Act. It required the Secretary of Defense to develop and explain "a policy for determining applicable environmental compliance" at overseas military

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[111]"Fiscal Year 1991 Defense Authorization Act Conference Report," *Congressional Record*, October 23, 1990, p. H12224.

[112]"Number and Estimated Cost of Foreign Pollution Abatement Projects by Environmental Media" and "Number and Estimated Cost of Foreign Pollution Abatement Projects within Foreign Facilities."

[113]"Trip Report to the Hague and EUCOM," p.3.

installations..." It also directed DOD to determine how much it would cost, in money and personnel, to comply with applicable environmental rules abroad.[114]

Recommendations

The Pentagon, Congress, GAO, and EPA owe it to the citizens of allied countries as well as to the global environment to disclose the facts concerning the military's use and abuse of hazardous materials abroad, and to work expeditiously to clean up the pollution that DOD has caused.

1. The Pentagon must keep better track of its waste management worldwide.

2. The Pentagon should include foreign bases in its Defense Environmental Restoration Program, and DERA funding should be boosted so that foreign liabilities don't reduce domestic cleanup expenditures.

3. The General Accounting Office reports on contamination at foreign bases must be made public in their entirety. The Pentagon should not hide information about its environmental wreckage at foreign bases behind the veil of "national security."

4. The Environmental Protection Agency should be given both the jurisdiction and resources to enforce U.S. environmental standards at foreign bases. Arrangements may be made between the EPA and foreign governments to defer to enforcement by the foreign government, where the foreign agency has the authority, resources, and competence to enforce standards equal to or stricter than the U.S. standard. Such arrangements should be made in writing and publicly disclosed in the U.S. and the host nations.

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[114]"Fiscal Year 1991 Defense Authorization Act Conference Report," p. H12188.

Epilogue

The Best Defense: Environmental Democracy

This report has made a number of policy recommendations for eliminating the toxic legacy of the Pentagon and turning the DOD into a force for positive environmental change. We have included proposals for funding of site cleanups, reporting on toxic releases, reorganizing the DOD waste management bureaucracy, promoting pollution prevention, and holding private polluters accountable. The National Toxics Campaign Fund is working with grass roots groups to pressure the various branches of government to implement these recommendations. As the national and global network of activists and organizations concerned about Pentagon toxics grows, we expect to refine the proposals in this report and possibly add new ones.

Pentagon leaders themselves are proposing some similar changes in public policy. But the Pentagon's record of environmental carnage and institutional arrogance doesn't inspire much confidence. Now that the Berlin Wall is down and Soviet Communism has diminished as a threat, the nation's need for weapons with global destruction capabilities has declined. While one might expect funds to flow quickly away from big high-tech weapons programs and toward a comprehensive effort to staunch the environmental wounds caused by the Cold War, instead the military may be permanently preoccupied with policing other areas of the world, such as the Middle East.

Today, the Pentagon has begun to acknowledge its environmental misdeeds of the past, and it has, at least on paper, committed itself to cleaning up its mess. In addition, DOD is working to reduce the amount of hazardous waste it actually generates. Moreover, Congress has decided to enlist the military's surveillance capability and research labs in the war on environmental degradation. At the urging of Senate Armed Services Committee chairman Sam Nunn (D-Georgia), it established the $150 million Strategic Environmental Research and Development Program.

In September, 1990, the Pentagon staged the Defense and the Environment Initiative conference in Bethesda, Maryland, bringing together several hundred people from government, industry, and environmental groups to highlight DOD's new environmental consciousness. Though the Pentagon locked grass roots activists out of the official plenary agenda, it displayed its new sensitivity by giving environmentalists unprecedented access to high-level military brass and DOD administrators in small group discussions.

Notwithstanding these efforts to reorient the military, the DOD's programs to reduce, control, and clean up its hazardous wastes remain mired in bureaucracy and incompetence. The President and Congress have simply not provided sufficient funds to meet DOD's environmental goals. The once-promising Defense and the Environment Initiative, without a staff, has not yet even sent reports to its conference participants.

Nor can we rely upon leadership for cleaning up the Pentagon to come from state and federal regulatory agencies. Although these agencies include many dedicated environmental proponents, they are underfunded and often lack the clout to enforce their own rules against the Pentagon. Thus, they have historically followed the path of least resistance and left the Pentagon "fox" to guard its own "chicken coop."

In the history of environmental politics, one principle stands clear: The "best defense" against the environmental offenses of any of society's large institutions, including the military, is public awareness and action. Environmental conditions are improved when people insist upon democratic participation in "national security" decisions that threaten their lives through environmental degradation.

In many parts of the country, community and environmental groups have organized effectively to clean up military sites—publishing reports, mounting demonstrations, filing lawsuits, and pressuring legislators. The Pentagon's new-found environmental consciousness is a testament to these groups' skill, imagination, and tenacity. But most of the military's polluting installations have escaped attention; at those facilities where public note has been taken, critics have typically focused on only one of dozens of environmental problems. Not all bases are sharing essential information with the public or the press. Even military personnel who are newly transferred to an installation are generally not told about contamination and the threat it may pose to their dependents.

National and local initiatives go hand-in-hand toward the cleanup of the military. The diverse efforts of activists at military toxics sites scattered around the nation are beginning to shape the national policy debate. Even if citizens were to succeed nationally in enacting ideal pollution prevention legislation and winning adequate funding for restoration programs, these would be hollow victories if a strong locally-based constituency for cleanup does not emerge. Only a far-reaching network of local citizen watchdogs can ensure that each and every unit of the military industrial complex behaves responsibly and cleans up its act.

Recommendations

Each military installation with significant contamination has established, or is developing, a community relations program, designed to demonstrate that military

Case Study: Kirtland Air Force Base, Albuquerque, New Mexico

Kirtland Air Force Base, a Military Airlift Command installation in Albuquerque, New Mexico, has 37 on-base sites with possible hazardous waste contamination, but it has not been placed on the Superfund National Priorities List. Nevertheless, residents of the nearby Mountainview subdivision have organized for more than three years to demand that authorities determine whether wastes from Kirtland are responsible for poisoning their water supply.

Mountainview is a semi-rural, low-income, predominantly Chicano/Latino community of more than 3,000 people. Historically, residents have relied upon private wells for both drinking and agricultural water supplies. Mountainview lies "downstream" from Kirtland on the Tijeras Arroyo, a stream bed that fills quickly with water whenever it rains.

As early as 1969, the U.S. Geologic Survey discovered high levels of nitrates in the well serving the Mountainview Elementary School. In 1980, a Mountainview baby nearly died after drinking formula made with nitrate-contaminated well water. As a result, county officials increased their sampling of groundwater; in 1982-1983, the city government, with financial assistance from the state and county, extended its water lines to Mountainview.

In 1986, state water testing found that the nitrate pollution included nitroaromatic compounds, such as nitroglycerine and nitrobenzene, used in explosives. Naturally, residents suspected Kirtland, but base officials denied responsibility. With the help of the SouthWest Organizing Project (SWOP), residents formed the Mountainview Advisory Council (MAC). They contacted elected officials, who in turn made sure that $100,000 in Kirtland installation restoration funds would finance a study to determine whether Kirtland had contributed to groundwater pollution. When the Air Force hired the U.S. Geological Survey to conduct the study, SWOP and MAC demanded and received an advisory role.

Lorraine Hufstutler, a representative of the Mountainview community, testified at a Congressional hearing:

> We, the residents of Mountainview, have not flushed explosive materials such as dinitrotoluene, dinitrobenzene, and nitroglycerin down our toilets. We can no longer grow our gardens, we can no longer safely bathe, and we have no water to drink. We have already paid a very dear price for having our well water seriously contaminated by outside sources. Our constitution guarantees us the right to life. Where there is no water, there is no life."[1]

Today, many Mountainview residents cannot afford city water, and they continue to drink from their wells. In the long run, the plume under Mountainview threatens water supplies well beyond the neighborhood. The city of Albuquerque, by drawing water from public wells to the north, is pulling contaminated groundwater closer to public water supplies.

In early 1990, when the Air Force established a working group to address environmental issues in the Albuquerque area, SWOP and MAC were on the scene. They requested, and won, formal participation in the working group, including participation in its rotating chair, along with the Air Force and state and federal environmental agencies. Originally, the Air Force presented a charter explaining that the working group was part of its community relations plan for complying with federal hazardous waste laws. At SWOP/MAC's insistence, the charter now states, "A primary purpose of the Group shall address groundwater contamination in the Mountainview community and its possible connection to activities by KAFB and/or its tenants."

If the Geologic Survey study or other investigation conclusively shows that Kirtland is responsible for the contamination of Mountainview's wells, it is likely that the Air Force will pick up the tab for alternative water supplies. Depending upon the extent of the problem, Kirtland may be elevated to the National Priorities List under Superfund. In any event, officials know that the community, despite its limited financial resources, will be watching closely.

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[1] *Groundwater Contamination*. Hearing before the Subcommittee on Natural Resources, Agricultural Research, and Environment, House Committee on Science, Space, and Technology, November 21, 1985, p. 122.

bases are good neighbors. While such programs can easily become one-sided public relations gimmicks, organized citizens can transform them into forums to practice environmental democracy on the local level. At a minimum, these programs offer community leaders a chance to obtain key information about local military toxics issues and a platform to influence or challenge cleanup methods and other environmental practices.

The following steps are being taken by locally-based activists to eliminate the military toxics threat:

1. Demanding a right to know exactly what poisons are released into their neighborhoods, how much, and when.

2. Demanding that genuine grass roots leaders, as well as local public officials, are represented on each base's official environmental advisory committee or Technical Review Committee. By placing one or more community representatives on such committees, organizations are gaining access to both officials and information, and as well as added legitimacy.

3. Demanding the right to inspect and monitor bases with their own experts. Citizens are checking contamination data directly, either by sampling water or soil independently or by requesting split samples from official testers. The National Toxic Campaign Fund operates an environmental laboratory, designed to independently measure toxic contamination and keep official labs honest.

   The need for independent testing is more than theoretical. The EPA is investigating at least ten testing labs that worked for Federal agencies and may have falsified data or conducted improper testing. EPA recently charged with fraud and suspended from government work the industry giant, U.S. Testing.[115] NTCF calls upon the Defense Department to formally recognize the right of base neighbors to inspect facilities and take water or soil samples. While sensitive national security interests must be protected, the public has a legitimate interest and right to review and inspect hazardous materials management practices at all areas of local facilities where military secrets are not involved.

4. Evaluating facility behavior through the National Toxic Campaign Fund's "Grass Roots Environmental Evaluation of Federal Facilities" (GREEFF) Report Card to help citizens rate local bases and contractors for their performance on Right to Know, base cleanup, waste management, and pollution prevention.

5. Demanding the right to negotiate with base officials and contractors about environmental protection. In the long run, DOD public relations efforts will have little value unless the military is willing to listen and act on informed advice from people

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[115]Rob Taylor, "Probe Reveals Massive Fraud in Waste Tests" and "Giant Testing Firm Has Run Afoul of the Government Before," *Seattle Post Intelligencer,* May 4, 1990, pp. A1 and B11.

most affected by military pollution. Armed with data, analysis, and public support, community leaders are asking to negotiate with their military neighbors. When cleanup or other environmental plans are inadequate, grass roots groups are challenging them.

6. Applying for EPA Technical Assistance Grants, which supply funds to community groups for their role in monitoring Superfund cleanups. Since most of the DOD toxic facilities are not on the Superfund National Priorities List, NTCF also recommends the Defense Department offer similar grants of up to $100,000 to community groups at military toxics sites, whether or not they are listed on the NPL.

Appendix 1:

Department of Defense Cleanup Sites by State and Installation

(September 30, 1990)

The following table is taken from information contained in Appendix C of the *Defense Environmental Restoration Program Annual Report to Congress for Fiscal Year 1990* (February, 1990). The report uses incomplete names and abbreviations, but we have attempted to identify as many installations as possible by their commonly reognized names. In general, the number of active sites for each installation equals the total number of Installation Restoration Program sites minus sites where "No Further Response Action is Planned" and also minus those sites where the Defense Department reports that remediation has been completed.

Note: While the text and other tables in this report have not been changed for the second printing of *The U.S. Military's Toxics Legacy,* this table has been updated as a service to our readers.

Installation	Active Sites
ALABAMA	
Army	
Alabama Army Ammunition Plant	24
Anniston Army Depot	44
Fort McClellan	60
Fort Rucker	106
Phosphate Development Works—Tennessee Valley Authority	31
Redstone Arsenal	71
Air Force	
Abston Air Guard Station	5
Birmingham Municipal Airport	16
Dannelly Field Air National Guard	5
Gunter Air Force Base	1
Hall Air Guard Station	4
Maxwell Air Force Base	22
Montgomery Air Guard Station	5
ALABAMA TOTALS	394

Installation

ALASKA

Army

Fort Greeley
Fort Richardson
Fort Wainwright
Gerstle River Test Site

Navy

Amchitka
Adak Naval Air Station
Barrow Naval Arctic Laboratory
Special Areas Alaska Naval Oceans Systems Command

Air Force

Alaskan Dewline
Bear Creek Radio Relay Station
Bethel Radio Relay Station
Big Mountain Radio Relay Station
Campion Air Force Station
Cape Romanzof Air Force Station
Clear Air Force Base
Clear Air Force Station
Cold Bay Air Force Station
Duncan Canal Radio Relay Station
Eielson Air Force Base
Elmendorf Air Force Base
Fire Island
Fort Yukon Air Force Station
Galena Airport
Gold King Creek Radio Relay Site
Granite Mountain Radio Relay Station
Indian Mountain Research Site
King Salmon Air Force Station
Kotzebue Air Force Station
Kulis Air National Guard Base
Murphy Dome Air Force Station
Naknek Recreation Camps
Nikolski Radio Relay Site
Nome Tank Farm
North River Radio Relay Site
Ocean Cape Radio Relay Site
Pillar Mountain Radio Relay Station
Port Heiden Radio Relay Site
Shemya Air Force Base
Smugglers Cove Radio Relay
Soldotna Radio Relay Station
Sparrevohn Air Force Station
Tatalina Air Force Station
Tin City Air Force Station
Unalakaleet Radio Relay Station

Defense Logistics Agency

Anchorage Defense Fuel Support Point
Fairbanks Defense Fuel Support Point
Whittier Defense Fuel Support Point

ALASKA TOTALS

Installation	Active Sites
ARIZONA	
Army	
Buckeye National Guard	1
Florence National Guard	1
Fort Huachuca	62
Navajo Army Depot	47
Popago Park Military Reservation National Guard	1
Yuma Proving Ground	43
Navy	
Yuma Marine Corps Air Station	13
Air Force	
Air Force Plant No. 44 (Tucson)—Hughes Aircraft (GM)	14
AJO Air Force Station	1
Alcoa Air Guard Station	5
Davis Monthan Air Force Base	40
Luke Air Force Base	15
Sky Harbor Airport (Phoenix Air National Guard)	5
Tucson Airport (Arizona Air National Guard)	13
Williams Air Force Base	11
ARIZONA TOTALS	272
ARKANSAS	
Army	
Fort Chaffee	34
Pine Bluff Arsenal	43
Air Force	
Eaker Air Force Base	12
Fort Smith MAP	1
Hot Springs Field	2
Little Rock Air Force Base	52
ARKANSAS TOTALS	144
CALIFORNIA	
Army	
Camp Elliott National Guard	1
Camp Parks Reserve Forces Training Area	3
Camp Roberts	38
Chinese Camp	1
Clovis Army Reserve Center	1
East Fort Baker	1
Fort Cronkite	1
Fort Hunter Liggett	21
Fort Irwin	36
Fort Mac Arthur	18
Fort Ord	166
Hamilton Army Air Field	17

Installation	Active Sites
Oakland Army Base	7
Presidio of Monterey	14
Presidio of San Francisco	35
Rio Vista Reserve Training Area	2
Riverbank Army Ammunition Plant—NI Industries	3
Sacramento Army Depot	15
Santa Rosa High Frequency Radio Receiver	3
SAT COM	1
Sharpe Army Depot	38
Sierra Army Depot	21
Sloughouse	1
Van Nuys Maintenance Shop	1
Navy	
Alameda Naval Air Station	20
Barstow Marine Corps Logistics Base	37
Bridgeport Marine Corps Mobile Weapons Training Center	8
Camp Pendleton Marine Corps Base	16
China Lake Naval Weapons Center	17
Concord Naval Weapons Station	23
Coronado Amphibious Base	5
Dixon Naval Radio Transmitter Facility	2
El Centro Naval Airfield	16
El Toro Marine Corps Air Station	23
Hunter's Point Naval Shipyard	13
Imperial Beach Outlying Landing Field	4
Lemoore Naval Air Station	15
Long Beach Naval Shipyard	5
Long Beach Naval Station	6
Long Beach Naval Station—San Pedro Housing	1
Mare Island Naval Shipyard	23
Miramar Naval Air Station	9
Moffett Field Naval Air Station	20
Monterey Naval Postgraduate School	2
Morris Dam Facility Azusa Naval Oceans Systems Command	1
North Island Naval Air Station	11
Oakland Naval Supply Center—Alameda Annex	1
Oakland Naval Supply Center—Richmond Fuel Depot	4
Oakland Naval Supply Center	4
Point Mugu Pacific Missile Test Center	9
Pomona Naval Industrial Reserve Ordnance Plant—General Dynamics	3
Port Hueneme Construction Battalion Center	10
Salton Sea Test Range	1
San Clemente Island Naval Auxiliary Landing Field	10
San Diego Marine Corps Recruit Depot	2
San Diego Naval Oceans Systems Command	3
San Diego Naval Station	7
San Diego Naval Submarine Base	3
San Diego Naval Supply Center	3
San Diego Naval Training Center	2
San Pedro Defense Fuel Supply Center	8
Seal Beach Naval Weapons Station	28
Seal Beach Naval Weapons Station—Corona Detachment	1
Seal Beach Naval Weapons Station—Fallbrook Annex	6
Stockton Naval Communications Station	6
Sunnyvale Naval Industrial Reserve Ordnance Plant—Lockheed	13
Treasure Island Naval Station	23

Installation	Active Sites
Tustin Marine Corps Air Station	10
Twenty-Nine Palms Marine Corps Air Ground Combat Center	28
Warner Springs FASOTRAGRUPACDET	1
Air Force	
Air Force Plant No. 19 (San Diego)—General Dynamics	6
Air Force Plant No. 42 (Palmdale)—Rockwell, Lockheed, Nero, Northrop	27
Air Force Plant No. 70 (Folsom)—Aerojet (Gencorp)	11
Beale Air Force Base	27
Castle Air Force Base	39
Costa Mesa Air Guard Station	5
Edwards Air Force Base	70
Fresno Air National Guard	4
George Air Force Base	68
Hayward Airport	5
Los Angeles Air Force Station	37
March Air Force Base	41
Mather Air Force Base	38
McClellan Air Force Base	178
Mt. Disappointment	5
Mt. Martell Radio Relay Center	1
North Highlands Air Guard Station	5
Norton Air Force Base	31
Ontario Airport	6
San Diego Air Guard Station	2
Sepulveda Air Guard Station	5
Travis Air Force Base	46
Vandenberg Air Force Base	37
Defense Logistics Agency	
Estero Bay Defense Fuel Supply Point	1
Norwalk Defense Fuel Supply Point	2
Ozol Defense Fuel Supply Point	2
San Pedro Defense Fuel Supply Point	2
Tracy Defense Depot	15
CALIFORNIA TOTALS	1624

COLORADO

Army	
Fitzsimmons Army Medical Center	25
Fort Carson	48
Pueblo Depot Activity	35
Rocky Mountain Arsenal	154
Air Force	
Air Force Academy	5
Air Force Plant PJKS—Martin Marietta	33
Buckley Air National Guard	13
Lowry Air Force Base	5
Peterson Air Force Base	1
COLORADO TOTALS	319

Installation	Active Sites

CONNECTICUT

Army
- Manchester Family Housing
- Milford Family Housing
- New Britain Family Housing
- New Haven Army Reserve Center
- Portland Family Housing
- Shelton Family Housing
- Stratford Army Engine Plant—Textron-Lycoming (AVCO)
- Westport Family Housing

Navy
- Bloomfield Naval Weapons Industrial Reserve Plant—Kaman Aerospace
- East Lynne Naval Underseas Systems Command
- New London Naval Submarine Base

Air Force
- Bradley Air National Guard
- Orange Air Guard Station

CONNECTICUT TOTALS

DELAWARE

Army
- First Army Recreation Area
- New Castle National Guard
- Rehoboth Nike Site

Air Force
- Dover Air Force Base
- Greater Wilmington Airport (Air National Guard)

DELAWARE TOTALS

DISTRICT OF COLUMBIA

Army
- Camp Simms
- Fort McNair
- Walter Reed Army Medical Center

Navy
- Anacostia Naval Station
- Washington Naval Research Laboratory, Pomonkey Test Range

Air Force
- Bolling Air Force Base

DISTRICT OF COLUMBIA TOTALS

Installation	Active Sites
FLORIDA	
Army	
Aviation Supply Facility 49-A	3
Camp Blanding	1
Orlando Facility ARRCOM	2
Navy	
Cecil Field Naval Air Station	19
Ft. Lauderdale Naval Surface Weapons Center Det	1
Jacksonville Naval Air Station	46
Key West Naval Air Station	16
Mayport Naval Station	10
Orlando Naval Training Center	4
Orlando Naval Research Laboratory (UWS REF Detachment)	1
Panama City Naval Communications Station	8
Pensacola Naval Air Station	38
Pensacola Naval Technical Training Center	1
Whiting Field Naval Air Station	24
Air Force	
Cape Canaveral Air Force Station	2
Eglin Air Force Base	39
Homestead Air Force Base	20
Hurlburt Air Force Base	11
Jacksonville Air National Guard	8
MacDill Air Force Base	56
Patrick Air Force Base	35
Tyndall Air Force Base	22
FLORIDA TOTALS	367
GEORGIA	
Army	
Fort Benning	87
Fort Gillem	5
Fort Gordon	78
Fort McPherson	9
Fort Stewart	85
Hunter Army Airfield	10
Hunter ILS Middle Marker	1
Navy	
Albany Marine Corps Logistics Base	13
Kings Bay Naval Submarine Base	16
Air Force	
Air Force Plant No. 6 (Marietta)—Lockheed	15
Dobbins Air Force Base	7
L.B. Wilson AD	2
McCollon Air Guard Station	2
McKinnon Air Guard Station	2
Moody Air Force Base	20
Robins Air Force Base	23
Savannah Airport Air National Guard	7
Savannah FTS Air National Guard	4
GEORGIA TOTALS	386

Installation — Active Sites

GUAM

Navy

Agana Naval Air Station
Guam Naval Communications Area Master Station
Guam Naval Magazine
Guam Naval Regional DEN Center
Guam Naval Ship Repair Facility
Guam Naval Station
Guam Naval Supply Depot
Guam Public Works Center

Air Force

Andersen Air Force Base

GUAM TOTALS

HAWAII

Army

Diamond Head Crater
Fort Kamahameha
Fort Shafter
Kapalama Military Reservation
Kilauea Military Reservation
Makua Military Reservation
Nike Site 3 and 4
Pohakuloa Training Area
Schofield Barracks
Tripler Army Medical Center
Waiawa Gulch Storage Area

Navy

Barbers Point Naval Air Station
Barking Sands Pacific Missile Range Facility
Camp H.M. Smith
Kaneohe Bay Marine Corps Air Station
Lualualei Naval Magazine
Naval Communications Area Master Station
Pearl Harbor NAVENPVNTMEDU No. 6
Pearl Harbor Naval Shipyard
Pearl Harbor Naval Station
Pearl Harbor Naval Submarine Base
Pearl Harbor Naval Supply Center
Pearl Harbor Public Works Center
Waikane Valley Impact Area, Kaneohe

Air Force

Bellows Air Force Station
General Lyman
Headquarters Pacific Air Force (Hickam)
Hickam Air Force Base
Hickam Petroleum-Oil-Lubricants
Hilo Communications Air Guard Station
Kaala Air Force Station
Kaena Point Station

Installation	Active Sites
Kahalui Air Guard Station	2
Kokee Air Force Station	2
Maui Air Force Station	13
Palehua Solar Observatory	2
Punamano Air Force Station	1
Wheeler Air Force Base	8
HAWAII TOTALS	165

IDAHO

Army	
AEC Site ARCO National Guard	1
Bonneville National Guard	1
Broken Kettle Training Area	1
Buhl National Guard	1
Gooding National Guard	1
Hailey National Guard	1
Idaho Falls National Guard	1
Kelly Canyon National Guard	1
Kimana National Guard	1
Orchard Range National Guard	1
Saint Anthony National Guard	1
Twin Falls City	1
Air Force	
Gowen Field Air National Guard (Boise)	11
Mountain Home Air Force Base	13
IDAHO TOTALS	36

ILLINOIS

Army	
Fort Sheridan	9
Joliet Army Ammunition Plant—Uniroyal	39
Joliet Army Training Center (National Guard)	1
Kankakee Army Reserve Center	9
North Riverside Maintenance Center	1
O'Hare Airport National Guard	1
Rock Island Arsenal	31
Savanna Army Depot Activity	30
St. Louis Support Center	40
Navy	
Glenview Naval Air Station	9
Great Lakes Naval Training Center	7
Air Force	
Capital Air National Guard	2
Chanute Air Force Base	18
Greater Peoria Air National Guard	4
O'Hare Air Reserve	7
O'Hare Reserve Training Center	1
Scott Air Force Base	9
Springfield-Beckley Municipal Airport	6
ILLINOIS TOTALS	224

Installation	Active Sites

INDIANA

Army
- AFRTA National Guard
- Crane Army Ammunition Activity
- Fort Benjamin Harrison
- Indiana Army Ammunition Plant—Imperial Chemical Industries
- Jefferson Proving Ground
- Newport Army Ammunition Plant—Mason & Hanger (Silas Mason)

Navy
- Crane Naval Weapons Support Center

Air Force
- Fort Wayne Air National Guard
- Grissom Air Force Base
- Hulman Air National Guard

INDIANA TOTALS

IOWA

Army
- Fort Des Moines
- Iowa Army Ammunition Plant—Mason & Hanger (Silas Mason)

Air Force
- Des Moines Air National Guard
- Sioux City Air National Guard

IOWA TOTALS

KANSAS

Army
- Fort Leavenworth
- Fort Riley
- Kansas Army Ammunition Plant—Day & Zimmerman
- Smokey Hill National Guard
- Sunflower Army Ammunition Plant—Hercules

Air Force
- Forbes Field
- McConnell Air Force Base

Defense Logistics Agency
- Atchison Defense Industrial Plant

KANSAS TOTALS

Installation	Active Sites
KENTUCKY	
Army	
Blue Grass Activity—Lexington Blue Grass Army Depot	53
Fort Campbell	35
Fort Knox	199
Greenville National Guard	1
Lexington Activity—Lexington Blue Grass Army Depot	45
Somerset National Guard	1
Navy	
Louisville Naval Ordnance Station	2
Air Force	
Standiford Field	1
KENTUCKY TOTALS	337
LOUISIANA	
Army	
Fort Polk	9
Louisiana Army Ammunition Plant—Morton Thiokol	6
New Orleans Army Base	1
Pearson Ridge	4
Navy	
New Orleans Naval Air Station	8
New Orleans NSA	2
Air Force	
Barksdale Air Force Base	25
England Air Force Base	12
Hammond Air Guard Station	2
Jackson Barracks	2
Defense Logistics Agency	
Baton Rouge DNSC	1
LOUISIANA TOTALS	72
MAINE	
Army	
Bangor Airport	1
Caswell National Guard	1
Riley-Bog Brook National Guard	1
Navy	
Brunswick Naval Air Station	11
Cutler Naval Communications Unit	2
Portsmouth Naval Shipyard	14

Installation	Active Sites
Air Force	
Bangor Air National Guard	
Loring Air Force Base	
South Portland	
Defense Logistics Agency	
Casco Bay Defense Fuel Supply Point	
Searsport Defense Fuel Supply Point	
MAINE TOTALS	

MARYLAND

Army	
Aberdeen Proving Ground	
Aberdeen Proving Ground—Edgewood Area	
Fort Detrick	
Fort George G. Meade	
Fort Ritchie	
Foster Nike Site 79	
Gaithersburg Research Facility	
Harry Diamond Labs (Adelphi)	
Lauderick Creek Training Center (National Guard)	
Phoenix Military Reservation	
Riverdale Army Reserve Center	
Wayland Nike Site National Guard	
Navy	
Annapolis Bay Head Annex, David Taylor Research Center	
Annapolis Naval Station	
Bainbridge Naval Training Center	
Bethesda David Taylor Naval Ship Research & Development Center	
Bethesda Naval Medical Command	
Indian Head Naval Ordnance Station	
Patuxent River Naval Air Station	
Solomon Island Naval REC Center	
Waldorf Naval Research Laboratory	
White Oak Naval Surface Weapons Center	
Air Force	
Air Force Systems Command HQ, Andrews	
Andrews Air Force Base	
Martin Airport Air National Guard	
Defense Logistics Agency	
Curtis Bay DNSC	
MARYLAND TOTALS	

Installation	Active Sites

MASSACHUSETTS

Army

Auburn	1
Camp Edwards National Guard	1
Fort Devens	36
Fort Devens/Sudbury Annex	11
Hull Family Housing	1
Materials Technology Laboratory (Watertown Arsenal)	20
Namant Family Housing	1
Natick Research & Development Engineering Center	5

Navy

Bedford Naval Weapons Industrial Reserve Plant—Raytheon	2
South Weymouth Naval Air Station	5

Air Force

Air Force Plant No. 28 (Everett)	4
Air Force Plant No. 29 (Lynn)	3
Barnes Air National Guard	7
Hanscom Air Force Base	20
Otis Air National Guard	78
Wellesley Air Guard Station	5
Westover Air Force Base	8
Worcester Air Guard Station	6

MASSACHUSETTS TOTALS	214

MICHIGAN

Army

Camp Grayling Airfield National Guard	1
Custer RFTA	1
Detroit Arsenal—General Dynamics	2
Fort Custer Recreation Area National Guard	1
Keweenaw Field Station	5
Nike Site 58 National Guard	1
Pontiac Storage Activity	7
Tank-Automotive Command Activity	10

Air Force

Arkabulta Annex	2
K.I. Sawyer Air Force Base	17
Phelps Collins Air National Guard	19
Selfridge Air National Guard	11
W.K. Kellogg Regional Airport	6
Wurtsmith Air Force Base	13

Defense Logistics Agency

Escanaba Defense Fuel Supply Point	1

MICHIGAN TOTALS	97

Installation	Active Sites
MINNESOTA	
Army	
Twin Cities Army Ammunition Plant	17
Navy	
Minneapolis Naval Industrial Reserve Ordnance Plant—FMC (Fridley)	4
St. Paul Naval Industrial Reserve Ordnance Plant—Unisys	2
Air Force	
Duluth Airport	22
Minneapolis St.Paul Airport	12
MINNESOTA TOTALS	57
MISSISSIPPI	
Army	
Camp McCain National Guard	1
Mississippi Army Ammunition Plant—Mason Chamberlain	46
Navy	
Gulfport Construction Battalion Center	8
Meridian Naval Air Station	4
Air Force	
A.C. Thompson Field Air National Guard	6
Bay St. Louis	1
Columbus Air Force Base	7
Gulfport	3
Gulfport Naval Construction Battalion Center	4
Keesler Air Force Base	11
Key Field Air National Guard	9
MISSISSIPPI TOTALS	100
MISSOURI	
Army	
Camp Clark	1
Fort Leonard Wood	51
Gateway Army Ammunition Plant	10
Lake City Army Ammunition Plant—Olin Corp.	28
Nike Site 30 National Guard	1
Weldon Springs Chemical Plant	28
Air Force	
Richards-Gebaur Air Reserve Station	7
Rosecrans Memorial Airport	4
St. Louis Lambert Field	1
Whiteman Air Force Base	13
MISSOURI TOTALS	144

Installation	Active Sites
MONTANA	
Army	
Fort Missoula	2
Limestone Hills National Guard	1
Air Force	
Great Falls Air National Guard	8
Harve Air Force Station	1
Malmstrom Air Force Base	22
MONTANA TOTALS	34
NEBRASKA	
Army	
Camp Ashland National Guard	1
Cornhusker Army Ammunition Plant—Mason & Hanger (Silas Mason)	6
Hastings National Guard	1
Lincoln Support Facility (National Guard)	2
Mead National Guard	1
Stanton National Guard	1
Stapleton National Guard	1
Navy	
Lincoln Naval Reserve Center	2
Air Force	
Lincoln Air National Guard	9
Offutt Air Force Base	32
NEBRASKA TOTALS	56
NEVADA	
Army	
Hawthorne Army Ammunition Plant—Day & Zimmerman/Basil Corp.	78
Indian Springs Range National Guard	1
Reno National Guard	1
Navy	
Fallon Naval Air Station	21
Air Force	
Nellis Air Force Base	36
Reno Cannon Airport Air National Guard	7
NEVADA TOTALS	144

Installation	Active Sites

NEW HAMPSHIRE

Army

Hopington West	1

Air Force

New Boston Air Force Station	1
Pease Air Force Base	36

Defense Logistics Agency

Newington Defense Fuel Supply Point	1

New Hampshire Totals **39**

NEW JERSEY

Army

Bayonne Military Ocean Terminal	33
Brittin Army Reserve Center	3
ERADCOM Flight Test Activity	3
Fort Dix	9
Fort Monmouth	9
Northfield Storck Army Reserve Center	4
Pedricktown Support Facility	5
Picatinny Arsenal	57
Trenton Stryker Army Reserve Center	3

Navy

Earle Colts Neck Naval Weapons Station	27
Lakehurst Naval Air Engineering Center	43
Trenton Naval Air Propulsion Center	9

Air Force

Atlantic City Airport	6
Coyle Air National Guard Training Annex	2
Ft. Dodge	1
McGuire Air Force Base	39
Warren Grove	2

Defense Logistics Agency

Somerville DNSC	1

NEW JERSEY TOTALS 256

NEW MEXICO

Army

Carlsbad National Guard	1
Demming National Guard	1
Fort Wingate	18
Santa Fe National Guard	1
Taos National Guard	1
Tucumcari National Guard	1
Walker Annex National Guard	1
White Sands Missile Range	73

Installation	Active Sites
Air Force	
Air Force Plant No. 83 (Albuquerque)	6
Cannon Air Force Base	22
Holloman Air Force Base	51
Kirtland Air Force Base	41
NEW MEXICO TOTALS	217

NEW YORK

Army	
Army Reserve Center (Army Maintenance Shop Activity)	2
Fort Drum	70
Fort Hamilton	5
Fort Tilden	3
Fort Totten	1
Hempstead Roosevelt Army Reserve Center	2
Malone National Guard	1
Nike Site 24	1
Rochester National Guard	1
Rocky Point Army Reserve Center	7
Seneca Army Depot	32
Stewart Army Subpost (USMAWP)	8
Ticonderoga National Guard	1
Watervliet Arsenal	23
West Point (US Military Academy)	4
Youngstown Training	1
Navy	
Bethpage Naval Weapons Industrial Reserve Plant—Grumman	3
Calverton Naval Weapons Industrial Reserve Plant—Grumman	10
Fishers Island Naval Undersea Systems Commnat	1
New York Staten Island Naval Station	3
Air Force	
Air Force Plant No. 38 (Lewiston)—Bell Aerospace (Textron)	4
Air Force Plant No. 59 (Johnson City)—General Electric	8
Griffiss Air Force Base	49
Hancock Field	8
Niagara Falls Airport	13
Plattsburgh Air Force Base	30
Roslyn Air Guard Station	5
Schenectady Airport Air National Guard	2
Stewart Air National Guard	2
Suffolk Air National Guard	7
Suffolk County (Former)	1
Youngstown Test (Rome Air Development Center)	10
Defense Logistics Agency	
Scotia DNSC	1
Verona Defense Fuel Supply Point	1
NEW YORK TOTALS	320

Installation	Active Sites

NORTH CAROLINA

Army

- Camp Mackall
- Fort Bragg
- Sunny Point Military Ocean Terminal
- Tarheel Army Missile Plant—AT&T Technologies

Navy

- Camp LeJeune Marine Corps Base
- Cherry Point Marine Corps Air Station

Air Force

- Badin Air Guard Station
- Charlotte Air National Guard
- Douglas Airport
- Pope Air Force Base
- Seymour-Johnson Air Force Base

NORTH CAROLINA TOTALS

NORTH DAKOTA

Army

- Garrison National Guard
- Stanley R. Mickelson SFG Rsl 1
- Williston National Guard

Air Force

- Grand Forks Air Force Base
- Hector Air National Guard
- Minot Air Force Base

NORTH DAKOTA TOTALS

OHIO

Army

- Blue Rock National Guard
- Camp Sherman National Guard
- Lima Army Tank Plant—General Dynamics
- Nike Site 78 National Guard
- Ravenna Army Ammunition Plant—Ravenna Arsenal, Inc.

Air Force

- Air Force Plant No. 16 (Evandale)
- Air Force Plant No. 85 (Columbus)—McDonnell Douglas
- Blue Ash Air National Guard
- Camp Perry Air Guard Station
- Mansfield Lahm Airport Air National Guard
- Newark Air Force Station
- Rickenbacker Air National Guard
- Toledo Express Airport Air National Guard

Installation	Active Sites
Wright-Patterson Air Force Base	112
Youngstown	5
Zanesville Air Guard Station	6
Defense Logistics Agency	
Columbus Defense Construction Supply Center	1
OHIO TOTALS	240

OKLAHOMA

Army	
Army Aviation Support Facility National Guard	1
Camp Gruber	1
Combined Support Maintenance Shop National Guard	1
Fort Sill	47
Hugo National Guard	1
Kegleman Aux Field National Guard	1
McAlester Army Ammunition Plant	50
Organizational Maintenance Shop 01 National Guard	1
Organizational Maintenance Shop 02 National Guard	1
Organizational Maintenance Shop 05 National Guard	1
Organizational Maintenance Shop 06 National Guard	1
Organizational Maintenance Shop 08 National Guard	1
Organizational Maintenance Shop 10 National Guard	1
Organizational Maintenance Shop 11 National Guard	1
Organizational Maintenance Shop 14 National Guard	1
Organizational Maintenance Shop 15 National Guard	1
Perry National Guard	1
Air Force	
Air Force Plant No. 3 (Tulsa)—McDonnell Douglas/Rockwell	12
Altus Air Force Base	10
Oklahoma City Air National Guard	1
Tinker Air Force Base	29
Tulsa Airport	1
Vance Air Force Base	10
Will Rogers World Airport	1
OKLAHOMA TOTALS	177

OREGON

Army	
Camp Adair National Guard	1
Redmond National Guard	1
Umatilla Army Depot Activity	76
Air Force	
Kingsley Field	12
North Bend Air National Guard	9
Portland Air National Guard	9
OREGON TOTALS	108

Installation	Active Sites
PACIFIC ISLANDS	
Navy	
Midway Naval Airfield	3
Air Force	
Johnston Island	5
Wake Island Airfield	23
PACIFIC ISLANDS TOTALS	31
PENNSYLVANIA	
Army	
C.E. Kelly Support Facility	4
Carlisle Army Barracks	3
East Jadwin Dam National Guard	1
Finleyville Nike Site National Guard	1
Fort Indiantown Gap	5
Gastonville Nike Site National Guard	1
Greenburg (Maintenance Shop 104)	4
Hays Army Ammunition Plant—Plant Facilities & Engineering, Inc.	1
Letterkenny Army Depot	40
Lock Haven National Guard	1
Manor Launch Site	1
New Cumberland Army Depot	12
Nike Site 43 National Guard	1
Pittsburgh Family Housing 43	1
Scranton Army Ammunition Plant—Chamberlain Manufacturing	10
Tobyhanna Army Depot	21
Navy	
Mechanicsburg Ship Parts Control Center	9
Philadelphia Naval Shipyard	13
Warminster Naval Air Development Center	8
Willow Grove Naval Air Station	17
Air Force	
Fort Indiantown Air Guard Station	5
Greater Pittsburgh Airport	9
Olmstead Field	1
Willow Grove Airfield	5
Defense Logistics Agency	
Philadelphia Defense Personnel Support Center	2
PENNSYLVANIA TOTALS	176

Installation	Active Sites
PUERTO RICO	
Army	
Camp Santiago	1
Fort Allen	6
Fort Buchanan	28
Navy	
Roosevelt Roads Naval Station	17
Sabana Seca Naval Security Group Activity	4
Air Force	
Muniz Air National Guard	10
Punta Salinas Air National Guard	3
PUERTO RICO TOTALS	69
RHODE ISLAND	
Army	
Camp Fogarty National Guard	1
US Army N. Smithfield Nike Site 99	1
Navy	
Davisville Construction Battalion Center	10
Newport Naval Education and Training Center	10
East Lyme Naval Underseas Systems Command	1
Fishers Island Underseas Systems Command	1
Air Force	
Coventry Air Guard Station	2
North Smithfield	2
Quonset State Airport Air National Guard	1
Defense Logistics Agency	
Melville Defense Fuel Supply Point	2
RHODE ISLAND TOTALS	31
SOUTH CAROLINA	
Army	
Clarks Hill Reservation	1
Fort Jackson	21
Navy	
Beaufort Marine Corps Air Station	14
Parris Island Marine Corps Recruit Depot	19
Charleston Naval Base	8
Charleston Naval Weapons Station	6
Air Force	
Charleston Air Force Base	29
McEntire Air National Guard	12
Myrtle Beach Air Force Base	27
Shaw Air Force Base	19
Defense Logistics Agency	
Charleston Defense Fuel Supply Point	1
SOUTH CAROLINA TOTALS	157

Installation	Active Sites
SOUTH DAKOTA	
Air Force	
Ellsworth Air Force Base	25
Joe Foss Field	6
SOUTH DAKOTA TOTALS	31
TENNESSEE	
Army	
Catoosa Range National Guard	1
Holston Army Ammunition Plant—Holston Defense Corp.	24
John Sevier National Guard	1
Milan Army Ammunition Plant—Martin Marietta	16
Smyrna Airport National Guard	1
Tullahoma AEDC National Guard	1
Volunteer Army Ammunition Plant—Imperial Chemical Industries	3
Navy	
Bristol Naval Weapons Industrial Reserve Plant—Raytheon	5
Memphis Naval Air Station	13
Air Force	
Alcoz Air Guard Station	1
Arnold Air Force Base	25
Lovell Field	2
McGhee Tyson Airport	14
Memphis Air National Guard	1
Nashville Air National Guard	1
Defense Logistics Agency	
Memphis Defense Depot	74
TENNESSEE TOTALS	183
TEXAS	
Army	
Addicks Reservoir National Guard	1
Barker Dam DZ National Guard	1
Camp Barkeley National Guard	1
Camp Bullis	16
Camp Swift National Guard	1
Canyon Lake Recreation Area	1
Corpus Christi Army Depot	17
Corpus Christi Army Reserve Center	1
Decatur National Guard	1
El Paso Site	1
Fort Bliss	28
Fort Hood	52
Fort Sam Houston	28
Fort Wolters National Guard	1
Fuels and Lubricant Research Lab	2
Houston Armed Forces Center	1
Lake Lavon, North Gully, Wylie	1
Lone Star Army Ammunition Plant—Day & Zimmerman	38
Longhorn Army Ammunition Plant—Morton Thiokol	58

Installation	Active Sites
Nike Site 80 National Guard	1
Panhandle Training Area National Guard	1
Red River Army Depot	32
Saginaw Army Aircraft Plant—Bell Helicopter (Textron)	1
Texarkana Reservoir National Guard	1
West Cleveland National Guard	1
Navy	
Chase Field Naval Air Station	4
Corpus Christi Naval Air Station	3
Dallas Naval Air Station	2
Dallas Naval Weapons Industrial Reserve Plant—Vought Corp.	7
Kingville Naval Air Station	7
McGregor Naval Weapons Industrial Reserve Plant—Hercules	3
Air Force	
Air Force Plant No. 4 (Ft. Worth)—General Dynamics	29
Bergstrom Air Force Base	12
Brooks Air Force Base	12
Carswell Air Force Base	16
Dyess Air Force Base	5
Ellington Air National Guard	5
Garland	5
Goodfellow Air Force Base	2
Kelly Air Force Base	72
Lackland Air Force Base	14
LaPorteAir Guard Station	6
Randolph Air Force Base	20
Reese Air Force Base	8
Sheppard Air Force Base	10
TEXAS TOTALS	529

UTAH

Army	
Blanding Launch Area	2
Dugway Proving Ground	121
Fort Douglas	23
Green River Test Site	12
Tooele Army Depot	30
Tooele Army Depot, South Area	27
Wig Mountain Area	5
Navy	
Magna Naval Industrial Reserve Ordnance Plant	6
Air Force	
Air Force Plant No. 78 (Corinne)—Morton Thiokol	19
Francis Peak Air Guard Station	1
Hill Air Force Base	38
Salt Lake City Airport Air National Guard	7
Defense Logistics Agency	
Ogden Defense Depot	22
UTAH TOTALS	313

Installation	Active Sites
VERMONT	
Army	
Ethan Allen Firing Range	6
Air Force	
Burlington Airport	2
VERMONT TOTALS	8
VIRGIN ISLANDS	
Air Force	
St. Croix	2
VIRGIN ISLANDS TOTALS	2
VIRGINIA	
Army	
Arlington Hall Station	1
Byrd Field	1
Callaghan	1
Cameron Station	6
Fort A.P. Hill	245
Fort Belvoir	59
Fort Eustis	26
Fort Lee	22
Fort Monroe	3
Fort Myer	5
Fort Story	3
Radford Army Ammunition Plant—Hercules	33
Vint Hill Farms Station	4
Virginia Beach National Guard	1
Woodbridge Research Facility	4
Navy	
Arlington Service Center	1
Cheatham Annex Williamburg Naval Supply Center	4
Craney Island NFD/Naval Supply Center	6
Dahlgren Naval Surface Weapons Center	5
Dam Neck Fleet Combat Training Center	2
Driver Naval Radio Station	3
Little Creek Amphibious Base	11
Norfolk Naval Communications Area Master Station	5
Norfolk NADEP	1
Norfolk Naval Shipyard	8
Oceana Naval Air Station	17
Portsmouth Naval Hospital	2
Quantico Marine Corps Combat Development Command	5
Yorktown Naval Supply Center, Fuels Division	4
Yorktown Naval Weapons Station	14
Air Force	
Byrd Air National Guard	3

Installation	Active Sites
WEST VIRGINIA	
Army	
Hinton National Guard	1
Volcano Range National Guard	1
West Virginia Ordnance Works	3
Navy	
Allegheny Ballistics Laboratory	10
Air Force	
Shepherd Field	3
Yeager	4
WEST VIRGINIA TOTALS	22
WISCONSIN	
Army	
Badger Army Ammunition Plant—Olin Corp.	12
Camp Williams	1
Camp Wismer	1
Fort McCoy	26
INO Range National Guard	1
Truax Field National Guard	1
Air Force	
Gen. Mitchell Field	4
Hardwood WR	1
Truax Field	3
Volk Field Air National Guard	17
WISCONSIN TOTALS	67
WYOMING	
Army	
Cheyenne Army Aviation Support Facility	1
Lander National Guard	1
Lovell National Guard	1
Sheridan National Guard	1
Air Force	
Cheyenne Air National Guard	5
F.E. Warren Air Force Base	18
WYOMING TOTALS	27

Appendix 2:

DOD Facilities on the Superfund National Priorities List, by State

	Facility Name	City or County
AL	Alabama Army Ammunition Plant	Childersburg
AL	Anniston Army Depot (Southeast Industrial Area)	Anniston
AK	Eielson Air Force Base	Fairbanks N Star Bor
AK	Elmendorf Air Force Base	Greater Anchorage Bo
AK	Fort Wainwright	Fairbanks N Star Bor
AZ	Air Force Plant No. 44 (Tucson Airport)	Tucson
AZ	Luke Air Force Base	Glendale
AZ	Williams Air Force Base	Chandler
AZ	Yuma Marine Corps Air Station	Yuma
CA	Barstow Maine Corps Logistics Base	Barstow
CA	Camp Pendleton Marine Corps Base	San Diego County
CA	Castle Air Force Base	Merced
CA	Edwards Air Force Base	Kern County
CA	El Toro Marine Corps Air Station	El Toro
CA	Fort Ord	Marina
CA	George Air Force Base	Victorville
CA	March Air Force Base	Riverside
CA	Mather Air Force Base (AC & W Disposal Site)	Sacramento
CA	McClellan Air Force Base (Groundwater contamination)	Sacramento
CA	Moffett Naval Air Station	Sunnyvale
CA	Norton Air Force Base	San Bernardino
CA	Riverbank Army Ammunition Plant	Riverbank
CA	Sacramento Army Depot	Sacramento
CA	Sharpe Army Depot	Lathrop
CA	Tracy Defense Depot	Tracy
CA	Travis Air Force Base	Solano County
CA	Treasure Island Naval Station, Hunters Point Annex	San Francisco
CO	Air Force Plant PJKS	Waterton
CO	Rocky Mountain Arsenal	Adams County
CT	New London Submarine Base	New London
DE	Dover Air Force Base	Dover
FL	Cecil Field Naval Air Station	Jacksonville
FL	Homestead Air Force Base	Homestead
FL	Jacksonville Naval Air Station	Jacksonville
FL	Pensacola Naval Air Station	Pensacola
GA	Marine Corps Logistics Base	Albany
GA	Robins Air Force Base	Houston County
HI	Schofield Barracks	Oahu

	Site Name	City/County
IA	Iowa Army Ammunition Plant	Middletown
ID	Mountain Home Air Force Base	Mountain Home
IL	Joliet Army Ammunition Plant (Load Assembly Packing Area)	Joliet
IL	Joliet Army Ammunition Plant (Manufacturing Area)	Joliet
IL	Savanna Army Depot Activity	Savanna
KS	Fort Riley	Junction City
LA	Louisiana Army Ammunition Plant	Doyline
ME	Brunswick Naval Air Station	Brunswick
ME	Loring Air Force Base	Limestone
MD	Aberbeen Proving Ground (Edgewood Area)	Edgewood
MD	Aberdeen Proving Ground (Michaelsville Landfill)	Aberdeen
MA	Fort Devens	Fort Devens
MA	Fort Devens-Sudbury Training Annex	Middlesex County
MA	Otis Air National Guard Base/Camp Edwards	Falmouth
MN	Naval Industrial Reserve Ordnance Plant	Fridley
MN	Twin Cities Air Force Reserve Base (Small Arms Range Landfill)	Minneapolis
MN	Twin Cities Army Ammunition Plant	New Brighton
MO	Lake City Army Ammunition Plant (Northwest Lagoon)	Independence
MO	Weldon Spring Quarry/Plant/Pits	St. Charles County
MO	Weldon Spring Former Army Ordnance Works	St. Charles County
NC	Camp Lejeune Military Reservation	Onslow County
NE	Cornhusker Army Ammunition Plant	Hall County
NH	Pease Air Force Base	Portsmouth/Newington
NJ	Fort Dix Landfill Site	Pemberton Township
NJ	Naval Air Engineering Center	Lakehurst
NJ	Naval Weapons Station Earle	Colts Neck
NJ	Picatinny Arsenal	Rockaway Township
NY	Griffiss Air Force Base	Rome
NY	Plattsburgh Air Force Base	Plattsburgh
NY	Seneca Army Depot	Romulus
OH	Wright-Patterson Air Force Base	Dayton
OK	Tinker Air Force Base	Oklahoma City
OR	Umatilla Army Depot	Hermiston
PA	Letterkenny Army Depot (Property Disposal Office Area)	Franklin County
PA	Letterkenny Army Depot (Southeast Area)	Chambersburg
PA	Naval Air Development Center	Warminster Township
PA	Tobyhanna Army Depot	Tobyhanna

Appendix 2: DOD Facilities on the Superfund National Priorities List

	Site Name	City/County
PR	Naval Security Group Activity	Sabana Seca
RI	Davisville Naval Construction Battalion Center	North Kingston
RI	Newport Naval Educationa & Training Center	Newport
SD	Ellsworth Air Force Base	Rapid City
TN	Milan Army Ammunition Plant	Milan
TX	General Dynamics Air Force Plant #4	Fort Worth
TX	Lone Star Army Ammunition Plant	Texarcana
TX	Longhorn Army Ammunition Plant	Karnack
UT	Hill Air Force Base	Ogden
UT	Ogden Defense Depot	Ogden
UT	Tooele Army Depot	Tooele
VA	Defense General Supply Center	Chesterfield County
WA	Bangor Naval Submarine Base	Silverdale
WA	Bangor Ordnance Disposal	Bremerton
WA	Fairchild Air Force Base	Spokane County
WA	Fort Lewis (Landfill #5)	Tacoma
WA	Fort Lewis Logistics Center	Tillicum
WA	McChord Air Force Base	Tacoma
WA	Whidbey Island Naval Air Station (Ault Field)	Whidbey Island
WA	Whidbey Island Naval Air Station (Seaplane Base)	Whidbey Island
WA	Naval Undersea Warfare Engineering Station	Keyport
WY	Warren Air Force Base	Cheyenne

Appendix 3:

Superfund National Priorities List Sites for which DOD is Potentially Responsible

State	County	Facility	Service
Arizona	Maricopa	Litchfied Park Naval Air Station	Navy
Arizona	Maricopa	Phoenix Goodyear Airport Area	DOD
California	Los Angeles	Jet Propulsion Laboratory	Air Force
California	Orange	McColl	DOD
California	Riverside	Stringfellow	Air Force
California	Sacramento	Aerojet General Corporation	Air Force
California	Santa Clara	Lorentz Barrel & Drum Company	Air Force
California	Santa Clara	TRW Microwave	DOD
California	Santa Clara	Westinghouse	DOD
Colorado	Adams	Lowry Landfill	Army
Delaware	Kent	Chem-Solv Inc.	Air Force
Florida	Duval	Hipps Road Landfill	DOD
Florida	Duval	Yellow Water Road	DOD
Florida	Escambia	Pioneer Sand Company	DOD
Illinois	Lake	Petersen Sand & Gravel	Navy
Indiana	Boone	Enviro-Chem Corporation	Navy
Indiana	Whitley	Wayne Waste Oil	Air Force
Kentucky	Fleming	Maxey Flats Nuclear Disposal	Army
Kentucky	Jefferson	Lees Lane Landfill	Navy
Maine	Aroostook	Pinette's Salvage Yard	DOD
Maine	Knox	Union Chemical Company, Inc.	Navy
Massachusetts	Middlesex	Silresim Chemical Company	Air Force
Massachusetts	Plymouth	Cannon Engineering Corporation	Navy
Massachusetts	Plymouth	Plymouth Harbor/Cannon Engineering	Navy
Michigan	Genessee	Berlin & Farro	Air Force
Michigan	Kalamazoo	Auto Ion Chemicals Inc.	Navy
Michigan	Macomb	Liquid Disposal Inc.	Air Force
Minnesota	Hennepin	FMC Corporation	DOD
Nebraska	Adams	Hastings Groundwater Contamination	Army
New Hampshire	Hillsborough	Sylvester's	Navy
New Hampshire	Rockingham	Keefe Environmental Services	Navy
New Hampshire	Rockingham	Tinkham Garage	Navy
New York	Oswego	Pollution Abatement Services	Air Force
New York	Putnam	Marathon Battery Company	DOD
Ohio	Ashtabula	New Lyme Landfill	Navy
Ohio	Lawrence	South Point Plt	Army
Oklahoma	McClain	Hardage/Criner	Army
Oklahoma	Tulsa	Sand Springs Petrochemical Complex	Army
Oregon	Linn	Teledyne Wah Chang DOD	
Pennsylvania	Dauphin	Middletown Air Field	Air Force
Pennsylvania	Montgomery	Transicoil Inc.	Army
Pennsylvania	Susquehanna	Bendix Flight Systems Division	Army
South Carolina	Charleston	Burkette Properties	Navy
Tennessee	Shelby	North Hollywood Dump	Air Force
Texas	Dallas	Bio-Ecology Systems, Inc.	Air Force
Virginia	Warren	Avtex Fibers, Inc.	DOD
Washington	King	Western Processing Company, Inc.	Army
Washington	Pierce	Commencement Bay—Nearshore/Tide	Navy
Washington	Spokane	Colbert Landfill	Air Force
Washington	Whatcom	Northwest Transformer—Salvage Yard	Air Force
West Virginia	Mason	West Virginia Ordnance	Army
West Virginia	Monongalia	Ordnance Works Disposal Areas	Army
Wisconsin	Eau Claire	Eau Claire Ordnance Plant	Army

Appendix 4:

Military Hazardous Waste Land Disposal Facilities

State	County	Facility	Service
Arkansas	Jefferson	Pine Bluff Arsenal	Army
California	Kern	Edwards Air Force Base	Air Force
California	Merced	Castle Air Force Base	Air Force
California	Orange	Seal Beach Naval Weapons Station	Navy
California	Sacramento	McClellan Air Force Base	Air Force
California	San Bernardino	Fort Irwin National Training Center	Navy
California	San Bernardino	Norton Air Force Base	Air Force
California	San Diego	North Island Naval Air Station	Navy
California	Solano	Mare Island Naval Shipyard	Navy
California	Yuba	Beale Air Force Base	Air Force
Colorado	Adams	Rocky Mountain Arsenal	Army
Delaware	Kent	Dover Air Force Base	Air Force
Florida	Duval	Jacksonville Naval Air Station	Navy
Florida	Duval	Mayport Naval Station	Navy
Florida	Escambia	Pensacola Public Works Center	Navy
Georgia	Cobb	Air Force Plant No. 6—Lockheed	Air Force
Georgia	Dougherty	Albany Marine Corps Logistics Base	Navy
Guam	Yigo	Andersen Air Force Base	Air Force
Hawaii	Honolulu	Pearl Harbor NSY	Navy
Idaho	Ada	Boise ATM	Air Force
Idaho	Elmore	Mountain Home Air Force Base	Air Force
Illinois	Will	Joliet Army Ammunition Plant Manufr. Area	Army
Indiana	Clark	Indiana Army Ammunition Plant	Army
Indiana	Martin	Naval Weapons Support Center	Navy
Iowa	Des Moines	Iowa Army Ammunition Plant	Army
Kansas	Johnson	Sunflower Army AmmunitionPlant	Army
Kansas	Labette	Kansas Army Ammunition Plant	Army
Louisiana	Caddo	Louisiana Army Ammunition Plant	Army
Missouri	Jackson	Lake City Army Ammunition Plant	Army
Nevada	Mineral	Hawthorne Army Ammunition Plant	Army
New Jersey	Morris	Picatinny Arsenal	Army
New Mexico	Curry	Cannon Air Force Base	Air Force
New Mexico	Otero	Holloman Air Force Base	Air Force
New York	Schenectady	Watervliet Arsenal	Army
North Carolina	Craven	Cherry Point Marine Corps Air Station	Navy
Ohio	Portage	Ravenna Army Ammunition Plant	Army
Pennsylvania	Bucks	Warminster Naval Air Development Center	Navy
Pennsyvania	Franklin	Letterkenny Army Depot	Army
Pennsylvania	Monroe	Tobyhanna Army Depot	Army
Texas	Bexar	Kelly Air Force Base	Air Force
Texas	Bowie	Red River Army Depot	Army
Texas	Bowie	Lone Star Army Ammunition Plant	Army
Texas	Lubbock	Reese Air Force Base	Air Force
Texas	Nueces	Corpus Christi Naval Air Station	Navy
Utah	Davis	Utah Test and Training Range	Air Force
Utah	Tooele	Tooele Army Depot	Army
Virginia	Radford City	Radford Army Ammunition Plant	Army
Washington	Spokane	Fairchild Air Force Base	Air Force

Appendix 5:

Military Hazardous Waste Incineration Facilities

State	County	Facility	Service
Arizona	Coconino	Navajo Depot Activity	Army
California	Lassen	Sierra Army Depot	Army
Colorado	Pueblo	Pueblo Army Depot	Army
Hawaii	Honolulu	Naval Magazine Demilitarization Furnace	Navy
Illinois	Carroll	Savanna Army Depot	Army
Indiana	Vermillion	Newport Army Ammunition Plant	Army
Kentucky	Madison	Lexington Blue Grass Army Depot	Army
Maryland	Harford	Aberdeen Proving Ground	Army
Mississippi	Grenada	Camp McCain	Army
Mississippi	Harrison	Gulfport Construction Battalion Center	Navy
New Jersey	Monmouth	Earle Colts Neck Naval Weapons Station	Navy
New York	Seneca	Seneca Army Depot	Army
Oregon	Umatilla	Umatilla Army Depot	Army
South Carolina	Charleston	Charleston Naval Weapons Station	Navy
Utah	Tooele	Tooele Army Depot	Army
	Johnston Atoll	Johnston Atoll Chemical Agent Disposal System	Army

Abbreviations

AFP	Air Force Plant
ATSDR	Agency for Toxic Substances and Disease Registry
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act, also known as Superfund
CFC-113	chlorofluorocarbon-113 (also known as Freon)
D&EI	Defense and the Environment Initiative
DBCP	dibromochloropropane
DEM	Division of Environmental Management (North Carolina)
DERP	Defense Environmental Restoration Program
DESR	Defense Environmental Status Report
DIMP	disopropyl methyl phosphonate
DLA	Defense Logistics Agency
DRMO	Defense Reutilization and Materials Organization (new name for DRMS)
DRMS	Defense Reutilization and Marketing Service
DOD	Department of Defense
DOE	Department of Energy
DNT	dinitrotoluene
EPA	Environmental Protection Agency
FFCA	Federal Facilities Compliance Agreement
GAO	General Accounting Office
GOCO	Government-Owned Contractor-Operated
GREEFF	Grass Roots Environmental Evaluation of Federal Facilities
JPG	Jefferson Proving Ground
KAFB	Kirtland Air Force Base
MAC	Mountainview Advisory Council (Albuquerque, New Mexico)
NAS	Naval Air Station
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NIROP	Naval Industrial Reserve Ordnance Plant
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NTCF	National Toxic Campaign Fund
NWIRP	Naval Weapons Industrial Reserve Plant
PANIC	Poisoned Arsenal Neighbors of the Irondale Community (Denver area, Colorado)
PCA	Pollution Control Agency (Minnesota)
PCBs	Polychlorinated biphenyls
PCP	pentachlorophenol
PRP	Potentially Responsible Party
RCRA	Resource Conservation and Recovery Act
SOFA	Status of Forces Agreement
SST	supersonic transport
SVTC	Silicon Valley Toxics Coalition (Santa Clara County, California)
SWOP	SouthWest Organizing Project
TCAAP	Twin Cities Army Ammunition Plant
TCE	trichloroethylene
TRI	Toxic Release Inventory